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## Longitudinal and secular trends in parental encouragement for healthful eating, physical activity, and dieting throughout the adolescent years

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### Abstract

**Purpose**—Parental encouragement of healthful eating and physical activity has been found to be associated with adolescents' long-term healthful habits, while parental encouragement to diet has been associated with disordered eating behaviors among adolescents. However, little is known about how parental encouragement changes as adolescents grow older (longitudinal trends), or how parental encouragement has changed over time (secular trends). This study examined 5-year longitudinal and secular trends in adolescents' report of their parents' encouragement to eat healthfully, be physically active, and diet.

**Methods**—Project EAT surveyed a cohort of Minnesota adolescents (n=2516) in 1999 and 2004. Mixed-model regressions were used to assess changes in adolescents' report of parental encouragement from early to middle adolescence (middle school to high school) and from middle to late adolescence (high school to post-high school), and secular changes in parental encouragement among middle adolescents between 1999 and 2004.

**Results**—There were significant decreases in parental encouragement to eat healthfully, be active, and diet between early and middle adolescence. Between middle and late adolescence, among males parental encouragement for all behaviors decreased while among females parental encouragement to diet increased. Few secular changes in parental encouragement were observed between 1999 and 2004.

**Conclusions**—Given the importance of parental support for healthful eating and physical activity, efforts should be made to help parents maintain a high level of encouragement for their children's healthful behavior throughout adolescence. Parents of late-adolescent females should aim to decrease the pressure on their daughters to diet during these critical developmental years.

### Keywords

Adolescence; parenting; nutrition; physical activity; dieting; encouragement

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## Introduction

Developing and maintaining regular physical activity and healthful dietary intake habits during adolescence contributes to several positive health outcomes, including healthy weight maintenance, into the adult years [1-3]. Conversely, adolescents' use of dieting and unhealthy weight control behaviors including skipping meals and using diet pills and laxatives may be ineffective in achieving weight loss and may even contribute to excessive weight gain and other negative health outcomes [4, 5].

In general, studies suggest that parental encouragement and support play a critical role in adolescents' development of physical activity, dietary intake, and dieting habits. Parental encouragement to make healthful food choices has been associated with several positive dietary habits among adolescents including higher fruit and vegetable intake [6, 7] and intake of calcium-rich foods [8] and parental encouragement and support for physical activity has been associated with healthful adolescent physical activity habits in several cross-sectional and longitudinal studies [9-13]. Among the socio-demographically diverse population of adolescents that participated in Project EAT, parental encouragement to eat healthful food was associated with increased fruit and vegetable intake and protective against increased fast food intake over 5 years [14-16], and parental encouragement for physical activity was associated with higher physical activity through adolescence [17].

In contrast, parental encouragement of their adolescent to diet to control their weight has been associated with several negative outcomes including excessive worry about weight, binge eating, and use of unhealthy weight control behaviors [18-21]. Among adolescents in Project EAT, maternal encouragement of their sons to diet was associated with sons' increased risk of binge eating, dieting, and use of unhealthy weight control behaviors [22], and parental encouragement of their overweight child to diet was associated higher risk of depression, lower self esteem [23], and remaining overweight after five years [24].

Despite the importance of parental encouragement to adolescents' behaviors, apart from intervention studies [25], to date no studies have examined how weight-related parenting practices change as adolescents mature through adolescence. As adolescents become older and exhibit more independence, parents may spend less time with their children. Because of this, parents may have fewer opportunities to provide encouragement and/or adolescents may not feel as supported by their parents as they used to. Despite adolescents' increasing autonomy, research suggests that family relationships and the role of parents often evolve and may grow stronger as adolescents transition into young adulthood [26, 27], providing an important opportunity for parents to have a long-term impact on their children's behavior. Understanding how parental encouragement for healthy eating, physical activity, and dieting change during the adolescent years can inform public health and clinical efforts by identifying key developmental points at which parents may need additional guidance on how to best support their children.

Additionally, to our knowledge no studies have examined secular trends in parental encouragement for healthful eating, physical activity, and dieting. Secular trends identify how parenting practices have changed over time and may reflect changes in the social environment. For example, parental encouragement for weight-related behaviors may be affected by increased media attention to childhood obesity [28], the proliferation of unhealthy food options in communities [29], or increased opportunities for adolescents to engage in sedentary behavior [30]. By examining secular trends obtained by comparing adolescents of the same age at two different time periods, changes in parenting practices that may be a reaction to societal shifts such as these can be better understood.

The current study used data from Project EAT (Eating Among Teens), a 5-year longitudinal study of adolescents, to simultaneously examine (1) longitudinal changes in adolescents' perception of their parents encouragement to eat healthful food, be physically active, and diet to control their weight, as they age from early to middle adolescence, and middle adolescence to late adolescence, and (2) secular changes in adolescents' perception of their parents encouragement to eat healthful foods, be physically active, and diet to control their weight among middle adolescents (high school-aged) in 1999 and 2004.

## Methods

### Overview

During the 1998-1999 academic year, Project EAT enrolled 4746 participants including a younger cohort of middle-school students and an older cohort of high-school students. Project EAT aimed to resurvey the original participants by mail 5 years later (2003-2004) to assess changes in their eating and physical activity patterns and weight status. One-third of the participants (32.0%) were in the younger cohort; at Time 1 their mean age was 12.8 years ( $SD = 0.8$ ) and at Time 2 their mean age was 17.2 years ( $SD = 0.6$ ). Two-thirds of the participants (68.0%) were in the older cohort; at Time 1 their mean age was 15.8 years ( $SD = 0.8$ ) and at Time 2 their mean age was 20.4 years ( $SD = 0.8$ ). Of the original study population, 22.5% (1074) were lost to follow-up. Of the remaining 3672 participants who were contacted by mail, 2516 completed surveys. These 2516 participants represent 53.0% of the original study sample and 68.4% of participants who could be contacted. The University of Minnesota's Institutional Review Board Human Subjects Committee approved all study protocols.

### Measures

**Parental encouragement**—The Project EAT surveys included six items assessing the extent to which the adolescents' mothers and fathers encouraged them to eat healthful food, be physically active, and to diet to control their weight (2 items per topic for both mother and father). Response options to these questions were: “not at all”, “a little bit”, “somewhat”, and “very much.” Scoring of these items thus ranged from 1 through 4. The 2-week test-retest correlation among 161 adolescents was .70 for the items associated with parental encouragement to eat healthful foods, .66 and .69 for the items associated with encouragement to be physically active, and .58 and .64 for the items associated with encouragement to diet. Adolescents' responses to the mother and father items were averaged to produce a mean value for each type of encouragement. If an adolescent was missing a response for either one of their parents, the response for the remaining parent was used.

**Covariates**—Gender, race/ethnicity, and socioeconomic status (SES) were based on adolescents' self-report in 1999. Race/ethnicity was assessed with the question: “Do you think of yourself as . . . White, Black or African American, Hispanic or Latino, Asian American, Hawaiian or Pacific Islander, or American Indian or Native American.” Subjects could choose more than one category. Due to the small number of respondents in some of the racial/ethnic categories, Hawaiian or Pacific Islander, American Indian, Native American, and mixed heritage were combined to form a “mixed/other” category for this analysis. SES was primarily determined by adolescents' parental educational level, defined by the highest level of educational attainment of either parent [31].

Adolescents' body mass index (BMI) was derived from the formula: weight in kilograms divided by the square of height in meters. At Time 1, surveys were completed within school classes and participants both self-reported their height and weight and had their height and weight measured by trained study staff. At Time 2, surveys were mailed to study

participants and only self-reported heights and weights were collected. In examining trends, self-reported data at both time points were used. In cases in which self-reported BMI data at Time 1 were not available, but measured BMI data were available ( $n = 116$ ), item imputation was carried out based on measured BMI, age, race, and SES, within gender. At Time 1, BMI values based upon measured and self-reported heights and weight were found to be highly correlated ( $r = 0.85$  for females and  $0.89$  for males) [32]. Thus, BMI based on reported height and weight has much surrogate information for estimation of expected self-reported BMI.

### Statistical Analyses

Longitudinal and secular trends were estimated with individuals who had no missing data at both time points using mixed-model regression [33]. Mixed-model regressions included a main effect for year of survey, for being in the younger or middle adolescent cohort at Time 1, and the interaction of these two factors in order to assess differences in perceived parental encouragement across time, both within and between stages of adolescence. A random effect for individuals was used to account for longitudinal correlation. All mixed-model regressions were adjusted for baseline race/ethnicity, SES, and BMI at Time 1, and analyses were stratified by gender as gender differences were expected. Adjustment for age (in years) was made in the mixed model regression so that estimates and tests for secular changes among middle adolescents could compare participants in the older cohort in 1999 and participants in the younger cohort in 2004. Weight status-specific analyses compared adolescents who remained normal weight between Time 1 and 2 versus those who remained overweight/obese between Time 1 and 2, and race/ethnicity-specific analyses compared white versus non-white participants and white versus black/African American participants. In order to provide a standardized estimate of the difference in parental encouragement between time periods, effect sizes were calculated for those estimates that were statistically significant at  $p < 0.05$  by dividing the difference in the two time points by the gender-specific common standard deviation. A rule of thumb for assessing the magnitude of an effect size is that an effect size less than 0.2 is considered a small change, 0.2 to 0.5 is moderate change, and greater than 0.8 a large change [34].

Attrition in the study population between Time 1 and 2 did not occur at random; however, no significant differences were observed in the mean levels of parental encouragement at Time 1 after adjustment for age, race, and stratified by gender for those who participated in Project EAT at Time 1 compared to those who did not. In order to create estimates that were representative of the original sample, and therefore improve the generalizability of study findings to the original population of Project EAT, data were weighted to adjust for differential response rates at the second survey period using a response propensity method [35]. The weighted ethnic/racial and SES proportions were: 52% white, 16% black/African American, 5% Hispanic, 19% Asian, and 8% mixed/other race. SES was: low (16%), middle-low (19%), middle (27%), middle-high (24%), and high (14%). SAS software (v9.2, SAS Institute Inc, Cary, NC, 2008) was used for analyses.

## Results

### Longitudinal trends in parental encouragement: early to middle adolescence

During the transition from early to middle adolescence, significant decreases were observed in both males' and females' report of all three types of parental encouragement – perceived encouragement by parents to eat healthful foods ( $p < .001$  for males and females), encouragement to be physically active ( $p < .001$  for males and females), and encouragement to diet ( $p < .001$  for males,  $p = .02$  for females) (Table 1). The decrease in perceived encouragement to eat healthful foods between early and middle adolescence was moderate

with effect sizes of 0.32 and 0.39 for males and females respectively. Similarly, the decreases in perceived encouragement to be physically active for males and females in the younger cohort were moderate with effect sizes of 0.31 and 0.41 respectively. Although the decrease in encouragement to diet was significant among both the younger males and females, the decrease was smaller among females with an effect size of 0.14 for females compared to an effect size of 0.36 for males.

### **Longitudinal trends in parental encouragement: Middle to late adolescence**

Among males in the older cohort, longitudinal decreases were seen for perceived parental encouragement to eat healthful foods ( $p=.03$ ), be physically active ( $p<.001$ ), and diet to control weight ( $p=.02$ ). Compared to findings from the younger adolescents, the effect sizes for these decreases among the older adolescents were smaller, ranging from 0.12 for both encouragement to eat healthy foods and diet, to 0.23 for encouragement to be physically active. No significant longitudinal changes were seen in perceived parental encouragement to eat healthful foods and be physically active among females in the older cohort. However, an increase in parental encouragement to diet was observed among older females as they transitioned from middle to late adolescence ( $p=.003$ ); the effect size for this increase was relatively small (0.14).

### **Secular changes in parental encouragement (1999 to 2004)**

Secular changes in parental encouragement were also examined among middle adolescents in 2004 as compared to 1999. The only statistically significant change was a decrease in males' report of parental encouragement to diet ( $p=.03$ ). This change represents a small effect size of 0.13.

### **Weight status and race/ethnicity-specific findings**

To determine if the trends in adolescents' perception of their parents' encouragement varied by adolescents' weight status, longitudinal and secular trends for each type of encouragement were estimated separately for adolescents who were normal weight (BMI percentile  $< 85^{\text{th}}$ ) versus overweight/obese (BMI percentile  $\geq 85^{\text{th}}$ ) at both Time 1 and 2. No differences in the trends were observed between these groups.

Longitudinal and secular trends were also examined by adolescents' race/ethnicity, comparing white adolescents to non-white and black/African American adolescents. For females, no significant differences were observed by race/ethnicity. Among males, black/African American males reported significantly larger decreases in parental encouragement to eat healthy food between early and middle adolescence (2.9 to 2.0,  $p<.001$ ) and in encouragement to be physically active between early and middle adolescence (3.2 to 2.2,  $p<.001$ ), compared to white males (Healthy Food: 3.0 to 2.9,  $p=.09$ ; Physical Activity: 3.2 to 3.1,  $p=.05$ ). Largely driven by the relatively low report of parental encouragement by middle adolescent black/African American males in 2004, significant secular decreases in parental encouragement to eat healthfully (1999: 2.9 to 2004: 2.1,  $p<.001$ ) and be physically active (1999: 3.1 to 2004: 2.2,  $p=.001$ ) were observed among black/African American males. Additionally, a large secular decrease in parental encouragement to diet was observed among black/African American males (1999: 1.9, 2004: 1.4,  $p=.009$ ). No secular changes were observed among white males.

## **Discussion**

This study examined longitudinal and secular changes in parental encouragement of adolescents to eat healthful foods, be physically active, and diet to control their weight. Both males and females reported that parental encouragement for all of these behaviors decreased

between early and middle adolescence, when the adolescents were transitioning between middle and high school. Males in the older cohort, transitioning from middle to late adolescence, also reported decreases in all three types of parental encouragement. No changes in parental encouragement to eat healthful foods and be physically active were observed among older females; however, females moving from middle to late adolescence reported an increase in parental encouragement to diet. Race/ethnicity-specific analyses revealed that compared to white males, black/African American males reported larger decreases in parental encouragement to eat healthful foods and be active between early and middle adolescence, and larger secular decreases in all of the types of encouragement, between 1999 and 2004.

The decreases in adolescents' perception of parental encouragement observed between early and middle adolescence, and among males between middle and late adolescence, may be attributed to adolescents' increasing independence and autonomy in making health behavior decisions [36] or increasing conflict around parents' attempts to intervene on their child's activity and dietary intake [37]. Parents may decrease their encouragement for their children's health behaviors, either purposefully or unintentionally, as they feel that their children are making more decisions on their own and are less receptive to their parents' opinions. Additionally, as adolescents self-reported parental encouragement, study results may reflect changes in adolescents' perception rather than changes in parental behavior. As adolescents get older they may be spending more time less time with their family, or they may be more focused on school or other interests than before, and may perceive less parental encouragement than at previous points in their life regardless of actual changes in parental behavior. Particularly concerning are the large decreases in perceived parental encouragement for healthful behavior among black/African American males between early and middle adolescence. Further research is needed to understand changes in the parent/child relationship during adolescence among this population, and identify specific ways that black/African American families can ensure that their sons feel encouraged to eat healthfully and be active.

Based on previous findings from Project EAT [15-17, 38] and other studies of adolescents [6, 13, 15] that parental encouragement for healthful eating and physical activity have the potential to help adolescents' improve or maintain healthful behaviors into middle and late adolescence, efforts should be made to clarify why adolescents' perception of parental encouragement for healthful behaviors declines during this period. If parents have decreased the amount of encouragement they provide their children, parents may need guidance from healthcare providers and public health interventions on novel and creative ways to communicate with their adolescents, who may be spending increasing time out of the home. Specifically, adolescents may benefit from their parents identifying alternative and more subtle methods to support their adolescents' healthful behavior, including making healthful foods accessible in the home or providing transportation or financial resources so adolescents can participate in various types of physical activity.

The increase in perceived parental encouragement to diet among girls maturing from middle to late adolescence is concerning in light of the negative physical and emotional outcomes associated with parental encouragement to diet, including excessive weight concerns and disordered eating behaviors [18-20]. Although by late adolescence young women may have moved out of the home, research suggests that parents' attitudes about weight and dieting and encouragement of their daughter to diet can still negatively impact young women's body satisfaction and risk for disordered eating [20]. The increase in females' perception of parental encouragement to diet observed in the current study may be driven by parental concern about potential weight gain as their daughters begin post-high school pursuits. Although parents may be attempting to discuss weight and dieting to promote a healthy

lifestyle among their children, this perceived encouragement to engage in dieting behavior may have unintentional negative consequences for adolescents. Additionally, girls may report greater encouragement to diet from their parents as they move into late adolescence due to experiencing increased societal pressure to be thin, and attribute some of that pressure to their parents. Regardless of whether the increase in girls' perceived encouragement to diet is a result of changes in parental behavior or adolescents' perception of their parents' behavior, greater understanding of how parents and adolescents talk about weight, weight gain, pressure to be thin, and dieting is needed.

The secular declines in parental encouragement for healthy behaviors among black/African American boys and lack of secular change observed among other racial/ethnic and gender groups is surprising considering the dramatic increase in societal attention to childhood obesity during the study period. For example, between 1999 and 2003 news coverage in the US of obesity nearly tripled [28]. These counterintuitive findings may be because in response to increased awareness of obesity parents changed their weight-related parenting practices in ways not assessed in the current study, such as increasing their modeling of healthful behavior or modifying the types of food available in their home. It may also be that 5 years is too short a time period for significant changes in parenting practices to occur.

A strength of this study was its longitudinal design and inclusion of both middle and high school-aged adolescents at baseline, which allowed for simultaneous examination of longitudinal and secular trends. Additionally, the use of a racially, ethnically, and socio-economically diverse study sample allows for generalization of these findings to other populations of adolescents in the United States. A limitation of the current study is the small number of survey items assessing parental encouragement. Future studies may want to examine multiple types of parental support and encouragement, as well as other mechanisms through which parents influence their children's participation in these behaviors such as behavior modeling. Additionally, future studies should assess parents' report of the encouragement and support that they feel they provide their child for healthful eating, physical activity, and dieting. Parents' and adolescents' report of the family environment are often quite discrepant [39], and understanding both perspectives can inform the development of intervention messages that are relevant to both parents and children. Finally, future longitudinal studies are needed to examine secular changes in parenting practices over periods longer than 5 years as it may take more time for societal changes to influence the ways in which parents and children interact around health topics.

## Conclusion

The current study examined longitudinal and secular changes in parental encouragement of adolescents to eat healthful foods, be physically active, and diet to control their weight. These three parenting practices have been shown to play a role in adolescents' participation in health behaviors that have a significant impact on their current and future weight and health status. In light of the decreases seen in adolescents' report of parental encouragement for healthful eating and physical activity between the middle and high school years, and among males, between the high school and late adolescent years, efforts should be made to understand how parents can provide, and adolescents can perceive, high levels of support for their adolescent's healthful eating and activity as their child gains autonomy and moves into young adulthood. Further research is also needed to understand how clinicians, parents, and other adults talk about weight-related issues with adolescents, and how to make those conversations helpful to children and reduce the conflict and tension that is often experienced during conversations on these topics.

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Table 1

Longitudinal and Secular (1999-2004) Changes in Parental Encouragement for Healthful Eating, Physical Activity, and Dieting to Control Weight<sup>a</sup>

	Longitudinal Trend: Younger Adolescents			Longitudinal Trend: Older Adolescents			Secular Trend	
	Early Adolescence, 1999	Middle Adolescence, 2004	<i>p</i> for longitudinal trend	Middle Adolescence, 1999	Late Adolescence, 2004	<i>p</i> for longitudinal trend	Middle Adolescence change, 2004-1999	<i>p</i> for secular trend
<b>Parental Encouragement to Eat Healthful Foods (Range: 1-4)</b>								
<b>Males</b>	3.0 (.05)	2.7 (.05)	<.001	2.8 (.04)	2.7 (.04)	.03	-.06 (.07) <sup>b</sup>	.41
<b>Females</b>	3.1 (.05)	2.7 (.05)	<.001	2.8 (.03)	2.8 (.03)	.26	-.10 (.06)	.12
<b>Parental Encouragement to be Physically Active (Range: 1-4)</b>								
<b>Males</b>	3.2 (.05)	2.9 (.06)	<.001	3.0 (.04)	2.8 (.04)	<.001	-.10 (.07)	.15
<b>Females</b>	3.1 (.05)	2.7 (.05)	<.001	2.8 (.04)	2.7 (.03)	.11	-.07 (.07)	.26
<b>Parental Encouragement to Diet to Control Weight (Range: 1-4)</b>								
<b>Males</b>	1.7 (.05)	1.4 (.05)	<.001	1.6 (.03)	1.5 (.03)	.02	-.14 (.06)	.03
<b>Females</b>	1.6 (.04)	1.5 (.04)	.02	1.5 (.03)	1.6 (.03)	.003	.01 (.06)	.80

<sup>a</sup>Models adjusted for race/ethnicity, SES, age, and BMI

<sup>b</sup>Explanation of secular trend value: For example, in 2004 middle-adolescent males reported lower (-.06 units) parental encouragement to eat healthful food compared to middle-adolescent males in 1999. This decrease was not statistically significant.