



Published in final edited form as:

J Am Diet Assoc. 2011 July ; 111(7): 1004–1011. doi:10.1016/j.jada.2011.04.012.

Dieting and disordered eating behaviors from adolescence to young adulthood: Findings from a 10-year longitudinal study

Dianne Neumark-Sztainer, PhD, MPH, RD[Professor]

Division of Epidemiology & Community Health School of Public Health University of Minnesota
1300 South Second Street, Suite 300 Minneapolis, MN 55454

Melanie Wall, PhD[Professor]

Division of Biostatistics School of Public Health University of Minnesota 420 Delaware Street SE,
A460 Minneapolis, MN 55455

Current affiliation: Melanie Wall, PhD Professor of Biostatistics (in Psychiatry) Departments of
Biostatistics and Psychiatry Columbia University 1051 Riverside Drive, Unit 48 New York NY
10032 Phone: 212-543-5448 Fax: 212-543-5599 mmwall@columbia.edu

Nicole I. Larson, PhD, MPH, RD[Research Associate]

Division of Epidemiology & Community Health School of Public Health University of Minnesota
1300 South Second Street, Suite 300 Minneapolis, MN 55454 Phone: 612-625-5881 Fax:
612-626-7103 larsonn@umn.edu

Marla E. Eisenberg, ScD, MPH[Assistant Professor]

Pediatrics and Adolescent Health Department of Pediatrics University of Minnesota Room 370J
717 Delaware Street SE Minneapolis, MN 55455 Phone: 612-626-8602 Fax: 612-626-2134
eisen012@umn.edu

Katie Loth, MPH, RD[Research Assistant]

Division of Epidemiology & Community Health School of Public Health University of Minnesota
1300 South Second Street, Suite 300 Minneapolis, MN 55454 Phone: 612-624-5236 Fax:
612-626-7103 fall0075@umn.edu

Abstract

Background—Disordered eating behaviors are prevalent in adolescence and can have harmful consequences. An important question is whether use of these behaviors in adolescence sets the pattern for continued use into young adulthood.

Objective—To examine the prevalence and tracking of dieting, unhealthy and extreme weight control behaviors, and binge eating from adolescence to young adulthood.

Design—Population-based, 10-year longitudinal study (Project EAT-III: Eating Among Teens and Young Adults, 1999–2010).

Participants/setting—The study population includes 2,287 young adults (55% female, 52% non-white). The sample includes a younger group (mean age = 12.8±0.7 years at baseline and

© 2011 The American Dietetic Association. Published by Elsevier Inc. All rights reserved

Corresponding author Dianne Neumark-Sztainer, PhD, MPH, RD Phone: 612-624-0880 Fax: 612-626-7103 neumark@epi.umn.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

23.2±1.0 years at follow-up) and an older group (mean age = 15.9±0.8 at baseline and 26.2±0.9 years at follow-up).

Statistical analyses performed—Longitudinal trends in prevalence of behaviors were tested using generalized estimating equations. Tracking of behaviors were estimated using the relative risk of behaviors at follow-up given presence at baseline.

Results—In general, the prevalence of dieting and disordered eating was high and remained constant, or increased, from adolescence to young adulthood. Furthermore, behaviors tended to track within individuals and, in general, participants who engaged in dieting and disordered eating behaviors during adolescence were at increased risk for these behaviors ten years later. Tracking was particularly consistent for the older females and males transitioning from middle adolescence to middle young adulthood.

Conclusions—Study findings indicate that disordered eating behaviors are not just an adolescent problem, but continue to be prevalent among young adults. The tracking of dieting and disordered eating within individuals suggests that early use is likely to set the stage for ongoing use. Findings suggest a need for both early prevention efforts prior to the onset of harmful behavioral patterns, as well as ongoing prevention and treatment interventions to address the high prevalence of disordered eating throughout adolescence and young adulthood.

Keywords

Adolescence; young adulthood; longitudinal; dieting; disordered eating

Dieting, unhealthy weight control practices, and binge eating are often associated with poorer dietary intake (1–3). For example, in a population-based sample of Canadian adolescents, Woodruff and colleagues found that overall dietary quality was lower among youth who were dieting and had weight concerns, as compared to those not dieting and not weight concerned (2). Furthermore, dieting and disordered eating behaviors have been found to predict a number of problematic outcomes including increased risk for weight gain (4–8), obesity (6–8), and eating disorders (9–12) in adolescents (4, 6, 7, 12) and young adults (5, 12, 13). For example, in an analysis from an earlier study wave on the population participating in the current study, we found that adolescents engaging in dieting and those reporting unhealthy weight control behaviors were at two to three times greater risk for being overweight five years later, as compared to adolescents who did not engage in these behaviors at baseline (8). Given the harmful consequences associated with disordered eating behaviors, it is important to develop interventions aimed at their prevention.

A frequently asked question regards the best timing for interventions aimed at preventing disordered eating. A high prevalence of disordered eating behaviors during adolescence would support early prevention efforts, with the goal of intervening prior to the onset of these behaviors. If the prevalence of disordered eating remains stable or increases as young people transition throughout adolescence, then prevention efforts should be continued throughout these life transitions. While cross-sectional studies have shown a high prevalence of disordered eating during early and middle adolescence (14–16), longitudinal studies examining the course of disordered eating from early adolescence to young adulthood are limited in number and scope, and findings have not been consistent, possibly due to small samples and differences in participant characteristics and study methodologies (13, 17–22). Information regarding whether or not disordered eating tracks within individuals is also important in setting program priorities. Most research suggests that disordered eating behaviors during early adolescence are predictive of continued use of these behaviors, as well as progression to a clinical eating disorder during later adolescence or young adulthood (18, 19, 21–25). However, previous studies have limited generalizability given that most

have been conducted within predominantly white samples (13, 17, 18, 20, 21) of women (19–23), primarily of high socio-economic status (21, 22).

The current study expands upon the existing literature by examining the prevalence and tracking of dieting and disordered eating behaviors, including unhealthy weight control behaviors, extreme weight control behaviors, and binge eating with loss of control, longitudinally over a ten-year transitional period from adolescence to young adulthood, in a large and diverse population-based sample of young women and men. The first aim of the current study is to assess the prevalence of dieting and disordered eating as adolescents move into young adulthood. The second study aim is to determine whether these behaviors track within individuals over time. Specifically, we examine whether adolescents who diet and engage in disordered eating behaviors are at increased risk for these behaviors in young adulthood.

METHODS

Study design and population

Project EAT-III (Eating and Activity in Teens and Young Adults) is a 10-year longitudinal study aimed at examining eating, activity, and weight-related variables among young people. The sample for the current study included 1030 young men and 1257 young women. One third of participants (29.9%) were in the younger cohort; at baseline they were in early adolescence (mean age = 12.8±0.7 years) and at 10-year follow-up they were in early young adulthood (mean age = 23.2±1.0 years). Two thirds of participants (70.1%) were in the older cohort; at baseline they were in middle adolescence (mean age = 15.9±0.8 years) and at follow-up they were in middle young adulthood (mean age = 26.2±0.9 years).

At baseline (EAT-I: 1998–1999), 4,746 junior and senior high school students at 31 public schools in the Minneapolis/St. Paul metropolitan area completed in-class surveys and anthropometric measures (15, 26). At 10-year follow-up (EAT-III: 2008–2009) participants were mailed letters inviting them to complete online or paper surveys. Data were also collected at five-year follow-up and longitudinal trends in weight control behaviors have previously been described (27). The five-year follow-up data are not included in the current analysis, in order to focus on long-term changes in the prevalence and tracking of behavioral patterns and determine if behaviors begun in adolescence predict similar behaviors in young adulthood. All study protocols were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee. Parental consent and written assent from participants was obtained at baseline. For follow-up surveys, participants reviewed a consent form as part of the online survey or were mailed a consent form with their paper survey. Completion of the Project EAT-III survey implied written consent.

At 10-year follow-up, survey data were collected from 66.4% of those for whom correct contact information was available, representing 48.2% of the original cohort, for a final sample of 2,287 young adults. Attrition was not equal across sociodemographic characteristics. When compared to nonrespondents in Project EAT-III, respondents were more likely to be female, white, and of higher SES. Thus, in all analyses, we weighted our data to allow for the longitudinal sample to be more similar to the original cohort, and more representative of an adolescent/young adult population. Data were weighted using the response propensity method (28) where the inverse of the estimated probability that an individual responded at follow-up was used as the weight. We compared responders at follow-up with non-responders for the variables being examined in the current analysis (dieting, unhealthy and extreme weight control behaviors, and binge eating with loss of control). These comparison analyses were stratified by gender and adjusted for SES, ethnicity/race and non-response weights. In all but one case (responding males reported

lower extreme weight control behaviors than non-responders) there were no significant differences found for the targeted variables at baseline, indicating that the weighting was generally successful in correcting for any response bias. The final weighted sample was 48.4% white, 18.6% African American, 19.6% Asian, 5.9% Hispanic, 3.3% Native American, and 4.2% mixed or other race/ethnicity and was well-distributed across five levels of socioeconomic status (SES): low (18.0%), middle-low (19.0%), middle (26.2%), middle-high (23.3%) and high (13.5%).

Measures

Dieting was assessed with the 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.” Responses included: never, one to four times, five to 10 times, more than 10 times, and I am always dieting. As in previous analyses (8), responses were dichotomized into nondieters (responded never) and dieters (other responses) (Test-retest agreement [nondieter versus dieter] = 97%).

Unhealthy and extreme weight control behaviors were assessed with the question: “Have you done any of the following things in order to lose weight or keep from gaining weight during the past year?” (yes/no for each method). Responses categorized as unhealthy weight control behaviors included 1) fasted, 2) ate very little food, 3) used a food substitute (powder or a special drink), 4) skipped meals, and 5) smoked more cigarettes. Consistent with prior analyses (27), those reporting the use of one or more unhealthy weight control behaviors were coded as using unhealthy weight control behaviors (Test-retest agreement [none versus one or more behaviors] = 83%). Extreme weight control behaviors included 1) took diet pills, 2) made myself vomit, 3) used laxatives, and 4) used diuretics. Those reporting the use of one or more of these behaviors were coded as using extreme weight control behaviors (Test-retest agreement [none versus one or more behaviors] = 97%). Unhealthy and extreme weight control behaviors were also examined individually.

Binge eating with loss of control was assessed with the questions: “In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you (binge eating)” (yes/no). “During the times when you ate this way, did you feel you couldn't stop eating or control what or how much you were eating” (yes/no) (29). Those reporting yes to both of these questions were coded as engaging in binge eating with loss of control (Test-retest agreement = 92% [first question] and 84% [second question]).

Gender, age, race/ethnicity, and socioeconomic status (SES) were based on self-report. Participants were asked about their race/ethnicity (Test-retest $\kappa = 0.70\text{--}0.83$) as prior research has identified racial/ethnic differences in weight-related variables among young people (5, 30). The prime determinant of SES was the higher education level of either parent (Test-retest $\kappa = 0.78$) during the administration of the Project EAT-I survey (31).

Statistical analysis

Longitudinal trends in the prevalence of different behaviors were estimated and tested using generalized estimating equations (GEE) (32) to account for correlation within individuals across time. Specifically, for each outcome, log binomial models (33) were used including a main effect for year (1999 or 2010), cohort (younger or older), and a year by cohort interaction along with control variables including baseline ethnicity/race and SES and non-response weights. The time trends in each cohort were tested based on these models by forming contrasts combining the GEE estimates of the main effect for year and the year by cohort interaction. Regression-adjusted prevalences of behaviors over time and by cohort

were obtained based on the fitted log binomial models using the predicted probability for a person with average values on the control variables.

Tracking of behaviors within-person over time was estimated and tested using log binomial models of follow-up behaviors on baseline behaviors stratified by cohort and gender and controlling for non-response weights. Relative risks from these fitted models were used to test tracking and represent how many times more likely an individual was to be doing a behavior at follow-up given that they were doing the behavior at baseline. P-values and 95% confidence intervals for relative risks were calculated based on the likelihood ratio test. SAS 9.2 was used for all analyses.

RESULTS

Prevalence of dieting and disordered eating: adolescence to young adulthood

About half of the females reported dieting in the past year as compared to about a fourth of the males. Among both age cohorts of females, the prevalence of dieting remained fairly constant from adolescence through young adulthood (Figure 1a). Among males, the prevalence of dieting stayed constant over time in the younger age cohort, but significantly increased in the older cohort as they progressed from middle adolescence to middle young adulthood (21.9% to 27.9%, $p < .001$).

In the younger females, the prevalence of unhealthy weight control behaviors remained constant from early adolescence to early young adulthood (Figure 1b). Among older females, the prevalence of unhealthy weight control behaviors showed a statistically significant decrease from middle adolescence to middle young adulthood, but still remained very high (60.7% to 54.4%, $p = .004$). Approximately one-third of males reported unhealthy weight control behaviors, and the prevalence remained fairly constant over the study period in both age cohorts.

For extreme weight control behaviors, significant increases from adolescence to young adulthood were found in females for both age cohorts and for the older cohort of males (Figure 1c). Among females, the use of extreme weight control behaviors increased from 8.4% to 20.4% ($p < .001$) between early adolescence and early young adulthood and from 12.6% to 20.6% ($p < .001$) between middle adolescence and middle young adulthood. For the older males, extreme weight control behaviors increased from 2.1% in middle adolescence to 7.3% in middle young adulthood ($p < .001$).

Binge eating increased in the older cohorts of both females and males (Figure 1d). Among females, the prevalence increased from 9.9% during middle adolescence to 14.1% in middle young adulthood ($p = .012$). Among males, the prevalence of binge eating increased from 3.0% in middle adolescence to 5.9% in middle young adulthood ($p = .020$). Increases in binge eating among the younger cohorts of males and females were not statistically significant.

An examination of the specific types of extreme weight control behaviors revealed significant increases in diet pill use for all age and gender groups over the 10-year study period (see Figures 2a–2d). Among females, diet pill use increased from 3.3% to 12.4% ($p < .001$) between early adolescence and early young adulthood and from 6.5% to 16.1% ($p < .001$) between middle adolescence and middle young adulthood. For males, diet pill use increased from 0.6% to 3.8% ($p = .017$) between early adolescence and early young adulthood and from 1.1% to 6.6% ($p < .001$) between middle adolescence and middle young adulthood. Laxative use increased from 1.3% among females in middle adolescence to 4.8% among females in middle young adulthood ($p < .001$). In contrast, vomiting decreased from

6.8% during middle adolescence to 4.0% in middle young adulthood ($p=.010$) among the older cohort of females. Changes in diuretics were not statistically significant.

Tracking of dieting and disordered eating from adolescence to young adulthood

Dieting and disordered eating tended to track from adolescence to young adulthood, particularly among the older cohorts of females and males transitioning from middle adolescence to middle young adulthood (Table 1). Females and males from both age cohorts who dieted in adolescence were significantly more likely to diet in young adulthood, as compared to those who didn't diet during adolescence. Similarly, adolescents from all four age and gender groups who used unhealthy weight control behaviors in adolescence were at significantly greater risk for these behaviors in young adulthood. Use of extreme weight control behaviors during middle adolescence predicted greater risk for these behaviors ten years later during middle young adulthood for the older cohorts of females and males. Finally, binge eating during adolescence increased risk for binge eating during young adulthood for the older cohorts of females and males and for the younger females.

DISCUSSION

This study found that, in general, the prevalence of dieting and disordered eating behaviors was high and either remained constant or increased from adolescence to young adulthood. Of particular concern was the large increase in extreme weight control behaviors among youth transitioning from adolescence to young adulthood. Diet pill use more than tripled in most of the age and gender groups during the ten-year study period. Of concern, one-fifth of female young adults reported the use of extreme weight control behaviors. Furthermore, behaviors tended to track within individuals and, in general, participants who engaged in dieting and disordered eating behaviors during adolescence were at increased risk for these behaviors ten years later. Tracking was particularly consistent for the older females and males transitioning from middle adolescence to middle young adulthood. The tracking of these potentially harmful behaviors suggests that their use is not just “a phase” that adolescents go through, but instead indicate that early use of dieting and disordered eating behaviors may set the stage for continued use of these behaviors later on. Together the findings suggest a need for both early prevention efforts prior to the onset of behavioral patterns that tend to continue over time, as well as ongoing prevention and treatment interventions to address the high prevalence throughout adolescence and young adulthood.

Findings from the current study are generally in agreement with the available research that has examined population-based samples of males and females from adolescence through young adulthood, although there are some notable differences. Results from the current study showing gender differences in the course of disordered eating behaviors are in agreement with a prior 10-year longitudinal study conducted by Heatherton and colleagues among young people who were college students in 1982 (13). Both studies showed dieting and disordered eating behaviors continue to be more prevalent among females than males as they transition through adolescence and young adulthood. In addition, both studies found evidence of increases in dieting among males as they age through their twenties. However, Heatherton et al found that dieting and disordered eating behaviors decreased among females transitioning to middle young adulthood, while in the current study, the prevalence of these behaviors either increased or remained constant over time. These differences might reflect the use of different measures, secular trends, or real differences between the two sample populations. Heatherton et al conducted their baseline analysis on college students in 1982, nearly 30 years ago, thus secular changes are certainly possible. Furthermore, the sample studied by Heatherton et al was drawn from a selective Northeastern college in the United States, and had much higher levels of dieting at baseline (75%) than the Project EAT population (50%). With regard to the tracking of behaviors, Kotler and colleagues examined

longitudinal relationships between childhood, adolescent, and adulthood eating disorders over a 17-year interval (18). Their study population differed from the Project EAT population in that participants were drawn from a rural area and were primarily white. Additionally, outcome measures differed across the studies. Nevertheless, findings from both studies are similar in showing that disordered eating behaviors tend to track between adolescence and adulthood.

Study strengths include the population-based nature of the sample, its large size, and its diversity in terms of gender, ethnicity/race and socio-economic status. Much of the previous longitudinal work examining the course of disordered eating or eating disorders have included samples that were either female (19–23), primarily white (13, 17, 18, 20, 21), or from higher socio-economic backgrounds (21, 22), limiting the generalizability of the findings. The long follow-up period, which captured major periods of transition is another study strength as few other studies have followed adolescents into middle young adulthood. Finally, the use of two age cohorts allowed for the capturing of slightly different stages of transition and for the replication of findings in different individuals. However, study limitations also need to be taken into account in interpreting the findings. Dieting and disordered eating behaviors were assessed with brief self-reported measures and frequency of use of behaviors was not assessed. The use of diet pills once during the past year, while of concern, is less of a concern than the weekly use of diet pills. Additionally, there was attrition from the original study population. For this reason, analyses only included individuals who were present at both EAT-I and EAT-III assessments and the population was weighted by non-response propensity so that the statistical results can be considered more representative of the original school-based sample.

CONCLUSIONS

The ineffectiveness of dieting for weight gain prevention during adolescence (4–8), the harmful consequences associated with disordered eating behaviors (19, 34–37), and the high prevalence of these behaviors during adolescence (21, 38–40) have been shown in previous studies. The current study adds to this concerning body of literature by demonstrating that the high prevalence of these behaviors continues from adolescence through young adulthood. Furthermore, individuals who begin these behaviors during adolescence are placing themselves at increased risk for their continued use ten years later. Further research should explore tracking of dieting and disordered eating from adolescence to later stages of adulthood. Research with population-based samples is also needed to identify factors that predict continued use of these behaviors and progression to more serious outcomes such as eating disorders. It is also important to examine the effects of persistent use of dieting and disordered eating behaviors on behavioral, physical, and psychological outcomes such as binge eating, weight status, and depression. Finally, it is crucial to implement and evaluate interventions. Findings from the current study, in conjunction with previous studies, argue for early and ongoing efforts aimed at the prevention, early identification, and treatment of disordered eating behaviors in young people. Within clinical practices, dietitians and other health care providers should be asking about the use of these behaviors prior to adolescence, throughout adolescence, and into young adulthood. Given the growing concern about obesity, it is important to let young people know that dieting and disordered eating behaviors can be counterproductive to weight management (4–8). Young people concerned about their weight should be provided with support for healthful eating and physical activity behaviors that can be implemented on a long-term basis, and should be steered away from the use of unhealthy weight control practices.

References

1. Larson NI, Neumark-Sztainer D, Story M. Weight Control Behaviors and Dietary Intake among Adolescents and Young Adults: Longitudinal Findings from Project EAT. *J Am Diet Assoc.* 2009; 109(11):1869–1877. [PubMed: 19857628]
2. Woodruff SJ, Hanning RM, Lambraki I, Storey KE, McCargar L. Healthy Eating Index-C is compromised among adolescents with body weight concerns, weight loss dieting, and meal skipping. *Body Image.* Dec; 2008 5(4):404–408. [PubMed: 18640883]
3. Neumark-Sztainer D, Hannan PJ, Story M, Perry CL. Weight-control behaviors among adolescent girls and boys: Implications for dietary intake. *J Am Diet Assoc.* 2004; 104:913–920. [PubMed: 15175589]
4. Field AE, Austin SB, Taylor CB, Malspeis S, Rosner B, Rockett HR, Gillman MW, Colditz GA. Relation between dieting and weight change among preadolescents and adolescents. *Pediatrics.* 2003; 112(4):900–906. [PubMed: 14523184]
5. Field AE, Aneja P, Austin SB, Shrier LA, de Moor C, Gordon-Larsen P. Race and gender differences in the association of dieting and gains in BMI among young adults. *Obesity (Silver Spring).* Feb; 2007 15(2):456–464. [PubMed: 17299119]
6. Tanofsky-Kraff M, Cohen ML, Yanovski SZ, Cox C, Theim KR, Keil M, Reynolds JC, Yanovski JA. A prospective study of psychological predictors of body fat gain among children at high risk for adult obesity. *Pediatrics.* 2006; 117:1203–1209. [PubMed: 16585316]
7. Stice E, Cameron RP, Killen JD, Hayward C, Taylor CB. Naturalistic weight-reduction efforts prospectively predict growth in relative weight and onset of obesity among female adolescents. *J Consult Clin Psychol.* 1999; 67(6):967–974. [PubMed: 10596518]
8. Neumark-Sztainer D, Wall M, Guo J, Story M, Haines J, Eisenberg M. Obesity, disordered eating, and eating disorders in a longitudinal study of adolescents: How do dieters fare five years later? *J Am Diet Assoc.* 2006; 106:559–568. [PubMed: 16567152]
9. Joiner TE, Heatherton TF, Keel PK. Ten-year stability and predictive validity of five bulimia-related indicators. *Am J Psychiatry.* 1997; 154:1133–1138. [PubMed: 9247401]
10. Jacobi C, Hayward C, de Zwaan M, Kraemer HC, Agras WS. Coming to terms with risk factors for eating disorders: Application of risk terminology and suggestions for a general taxonomy. *Psychol Bull.* 2004; 130(1):19–65. [PubMed: 14717649]
11. Killen JD, Taylor CB, Hayward C, Haydel KF, Wilson DM, Hammer L, Kraemer H, Blair-Greiner A, Strachowski D. Weight concerns influence the development of eating disorders: A 4-year prospective study. *J Consult Clin Psychol.* 1996; 64:936–940. [PubMed: 8916622]
12. Heatherton, TF.; Polivy, J. Chronic dieting and eating disorders: A spirial model. In: Crowther, JH.; Hobfall, SE.; Stephens, MAP.; Tennebaum, DL., editors. *The etiology of bulimia nervosa: The individual and familial context.* Hemisphere Publishers; Washington, D.C.: 1992. p. 133-155.
13. Heatherton T, Mahamedi F, Striepe M, Field A, Keel P. A 10-year longitudinal study of body weight, dieting, and eating disorder symptoms. *J Abnorm Psychol.* 1997; 106(1):117–125. [PubMed: 9103723]
14. Leon GR, Fulkerson JA, Perry CL, Cudeck R. Personality and behavioral vulnerabilities associated with risk status for eating disorders in adolescent girls. *J Abnorm Psychol.* 1993; 102(3):438–444. [PubMed: 8408956]
15. Neumark-Sztainer D, Croll J, Story M, Hannan PJ, French S, Perry C. Ethnic/racial differences in weight-related concerns and behaviors among adolescent girls and boys: Findings from Project EAT. *J Psychosom Res.* 2002; 53:963–974. [PubMed: 12445586]
16. Neumark-Sztainer D, Hannan PJ. Weight-related behaviors among adolescent girls and boys: Results from a national survey. *Arch Pediatr Adolesc Med.* 2000; 154(6):569–577. [PubMed: 10850503]
17. Keel PK, Baxter MG, Heatherton TF, Joiner TE Jr. A 20-year longitudinal study of body weight, dieting, and eating disorder symptoms. *J Abnorm Psychol.* 2007; 116(2):422–432. [PubMed: 17516772]

18. Kotler LA, Cohen P, Davies M, Pine DS, Walsh BT. Longitudinal relationships between childhood, adolescent, and adult eating disorders. *J Am Acad Child Adolesc Psychiatry*. 2001; 40(12):1434–1440. [PubMed: 11765289]
19. Lewinsohn PM, Striegel-Moore RH, Seeley JR. Epidemiology and natural course of eating disorders in young women from adolescence to young adulthood. *J Am Acad Child Adolesc Psychiatry*. 2000; 39(10):1284–1292. [PubMed: 11026183]
20. Vohs KD, Heatherton TF, Herrin M. Disordered eating and the transition to college: A prospective study. *Int J Eat Disord*. 2001; 29:280–288. [PubMed: 11262506]
21. Graber JA, Brooks-Gunn J, Paikoff RL, Warren MP. Prediction of eating problems: An 8-year study of adolescent girls. *Dev Psychol*. 1994; 30(6):823–834.
22. Calam R, Waller G. Are eating and psychosocial characteristics in early teenage years useful predictors of eating characteristics in early adulthood? A 7-year longitudinal study. *Int J Eat Disord*. 1998; 24(4):351–362. [PubMed: 9813760]
23. Vogeltanz-Holmm ND, Wonderlich SA, Lewis BA, Wilsnack SC, Harris TR, Wilsnack RW, Kristjanson AF. Longitudinal predictors of binge eating, intense dieting, and weight concerns in a national sample of women. *Behavior Therapy*. 2000; 31:221–235.
24. Johnson JG, Cohen P, Kotler L, Kasen S, Brook JS. Psychiatric disorders associated with risk for the development of eating disorders during adolescence and early adulthood. *J Consult Clin Psychol*. 2002; 70(5):1119–1128. [PubMed: 12362962]
25. Steinhausen HC, Gavez S, Winkler Metzke C. Psychosocial correlates, outcome, and stability of abnormal adolescent eating behavior in community samples of young people. *Int J Eat Disord*. 2005; 37(2):119–126. [PubMed: 15732078]
26. Neumark-Sztainer D, Story M, Hannan PJ, Croll J. Overweight status and eating patterns among adolescents: Where do youth stand in comparison to the Healthy People 2010 Objectives? *Am J Public Health*. 2002; 92(5):844–851. [PubMed: 11988458]
27. Neumark-Sztainer D, Wall M, Eisenberg ME, Story M, Hannan PJ. Overweight status and weight control behaviors in adolescents: Longitudinal and secular trends from 1999–2004. *Prev Med*. 2006; 43(1):52–59. [PubMed: 16697035]
28. Little RJA. Survey nonresponse adjustments for estimates of means. *International Statistical Review*. 1986; 54(2):139–157.
29. Yanovski SZ. Binge eating disorder: Current knowledge and future directions. *Obes Res*. 1993; 1(4):306–324. [PubMed: 16350580]
30. Chao YM, Pisetsky EM, Dierker LC, Dohm FA, Rosselli F, May AM, Striegel-Moore RH. Ethnic differences in weight control practices among U.S. adolescents from 1995 to 2005. *Int J Eat Disord*. 2008; 41(2):124–133. [PubMed: 18008319]
31. Sherwood NE, Wall M, Neumark-Sztainer D, Story M. Effect of socioeconomic status on weight change patterns in adolescents. *Prev Chronic Dis*. 2009; 6(1)
32. Liang K, Zeger S. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986; 73:13–22.
33. Spiegelman D, Hertzmark E. Easy SAS calculations for risk or prevalence ratios and differences. *Am J Epidemiol*. 2005; 162(3):199–200. [PubMed: 15987728]
34. Wood A, Waller G, Gowers S. Predictors of eating psychopathology in adolescent girls. *European Eating Disorders Review*. 1994; 2(1):6–13.
35. Pawluck DE, Gorey KM. Secular trends in the incidence of anorexia nervosa: integrative review of population-based studies. *Int J Eat Disord*. 1998; 23(4):347–352. [PubMed: 9561424]
36. Hudson JI, Hiripi E, Pope HG Jr, Kessler RC. The prevalence and correlates of eating disorders in the national comorbidity survey replication. *Biol Psychiatry*. 2007; 61(3):348–358. [PubMed: 16815322]
37. Sallis, JF. Promoting healthful diet and physical activity. In: Millstein, SG.; Petersen, AC.; Nightingale, EO., editors. *Promoting the health of adolescents: new Directions for the Twenty-First Century*. Oxford University Press; New York: 1993. p. 209-241.
38. Eaton DK, Kann L, Kinchen S, Shanklin S, Ross J, Hawkins J, Harris WA, Lowry R, McManus T, Chyen D, Lim C, Brener ND, Wechsler H. Youth risk behavior surveillance--United States, 2007. *MMWR CDC Surveill Summ*. 2008; 57(4):1–131.

39. Serdula MK, Collins E, Williamson DF, Anda RF, Pamuk E, Byers TE. Weight control practices of U.S. adolescents and adults. *Ann Intern Med.* 1993; 119:667–671. [PubMed: 8363194]
40. Stein D, Meged S, Bar-Hanin T, Blank S, Elizur A, Weizman A. Partial eating disorders in a community sample of female adolescents. *J Am Acad Child Adolesc Psychiatry.* 1997; 36(8): 1116–1123. [PubMed: 9256591]

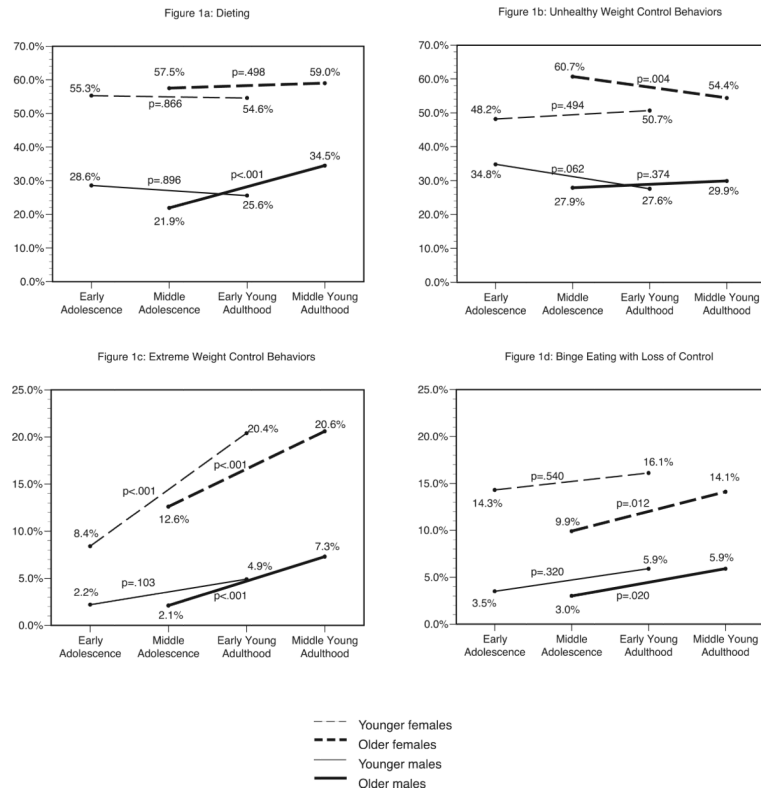


Figure 1. Prevalences of dieting, unhealthy and extreme weight control behaviors, and binge eating with loss of control from adolescence to young adulthood, by age cohort and gender*
 *Adjusted for socioeconomic status, and ethnicity/race. P-values test change over time.

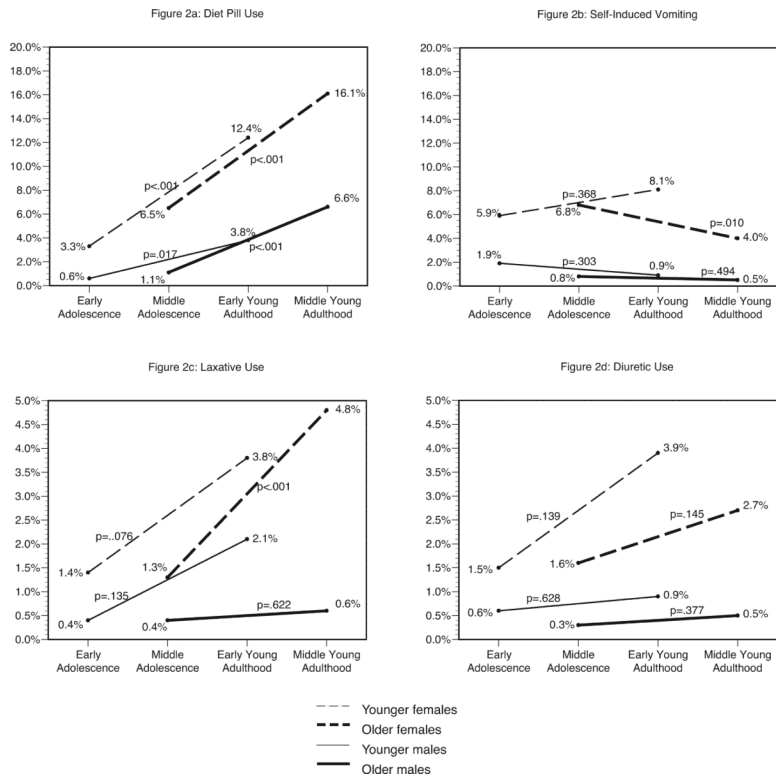


Figure 2. Prevalences of specific extreme weight control behaviors from adolescence to young adulthood, by age cohort and gender*
 *Adjusted for socioeconomic status, and ethnicity/race. P-values test change over time.

Table 1

Tracking of dieting, unhealthy, and extreme weight control behaviors, and binge eating over a 10-year period from adolescence to young adulthood by age and gender.

	Younger females (N=308)			Older females (N=722)			Younger males (N=377)			Older males (N=880)		
	RR	CI	p-value	RR	CI	p-value	RR	CI	p-value	RR	CI	p-value
Dieting	1.32	(1.09, 1.60)	.005	1.61	(1.41, 1.83)	<.001	1.46	(1.03, 2.05)	.033	2.27	(1.89, 2.72)	<.001
Unhealthy weight control behaviors	1.54	(1.27, 1.87)	<.001	1.73	(1.49, 2.01)	<.001	1.63	(1.19, 2.24)	.002	2.10	(1.72, 2.56)	<.001
Extreme weight control behaviors	1.22	(0.68, 2.20)	.509	2.13	(1.62, 2.80)	<.001	1.07	(0.11, 10.02)	.955	6.43	(3.63, 11.37)	<.001
Binge eating with loss of control	2.21	(1.31, 3.71)	.003	2.42	(1.68, 3.47)	<.001	0.47	(0.03, 7.12)	.586	5.27	(2.68, 10.34)	<.001

¹ Relative risks (RR) and 95% confidence intervals (CI) for engaging in behaviors in young adulthood if engaged in behavior during adolescence as compared to not having engaged in behavior in adolescence.