

## Original Investigation

# Prospective Associations of Concerns About Physique and the Development of Obesity, Binge Drinking, and Drug Use Among Adolescent Boys and Young Adult Men

Alison E. Field, ScD; Kendrin R. Sonneville, RD, ScD; Ross D. Crosby, PhD; Sonja A. Swanson, ScM; Kamryn T. Eddy, PhD; Carlos A. Camargo Jr, MD, DrPH; Nicholas J. Horton, ScD; Nadia Micali, MD, PhD

**IMPORTANCE** Relatively little is known about the prevalence of concerns with physique and eating disorders among males and their relation to subsequent adverse outcomes. A broader range of eating disorders needs to be defined to diagnose these illnesses appropriately in males.

**OBJECTIVE** To investigate whether males with psychiatric symptoms related to disordered eating and concern about physique are more likely to become obese, to start using drugs, to consume alcohol frequently (binge drinking), or to develop high levels of depressive symptoms.

**DESIGN, SETTING, AND PARTICIPANTS** The data come from questionnaires sent every 12 to 36 months from 1999 through 2010 to youth in a prospective cohort study, the Growing Up Today Study. The analysis included 5527 males aged 12 to 18 years in 1999 from across the United States who responded to the Growing Up Today Study questionnaires.

**MAIN OUTCOMES AND MEASURES** Development of obesity and high levels of depressive symptoms and initiation of drug use and binge drinking at least monthly.

**RESULTS** From 1999 through 2011 in at least 1 study year, 9.2% of respondents reported high concerns with muscularity but no bulimic behaviors; 2.4%, high concerns with muscularity and use of supplements, growth hormone derivatives, or anabolic steroids to achieve their desired physique; 2.5%, high concerns with thinness but no bulimic behaviors; and 6.3%, high concerns with thinness and muscularity. For eating disorders, 0.8% had partial- or full-criteria bulimia nervosa or purging disorder and 2.9% had partial or full-criteria binge eating disorder but no association with the outcomes of interest. Infrequent binge eating or purging or overeating without a loss of control were reported by 31.0%. However, independent of age and body mass index, males with high concerns about thinness but not muscularity were more likely to develop high depressive symptoms (odds ratio, 2.72; 95% CI, 1.36-5.44). Males with high concerns about muscularity and thinness were more likely than their peers to use drugs (odds ratio, 2.13; 95% CI, 1.31-3.46), and males with high concerns about muscularity who used supplements and other products to enhance physique were more likely to start binge drinking frequently (2.06; 1.58-2.69) and using drugs (2.16; 1.49-3.11).

**CONCLUSIONS AND RELEVANCE** High concerns with muscularity are relatively common among adolescent boys and young men. Males with these concerns who use potentially unhealthy products to improve their physique are at increased risk of adverse outcomes but may not be recognized by their health care providers as having a weight-related disorder because of the sex-specific presentation.

*JAMA Pediatr.* 2014;168(1):34-39. doi:10.1001/jamapediatrics.2013.2915  
Published online November 4, 2013.

**Author Affiliations:** Author affiliations are listed at the end of this article.

**Corresponding Author:** Alison E. Field, ScD, Division of Adolescent/Young Adult Medicine, Department of Medicine, Boston Children's Hospital, 300 Longwood Ave (AU-Box 17), Boston, MA 02115 (alison.field@childrens.harvard.edu).

At present, most research into eating disorders has been conducted among females. Relatively little is known about eating disorders among males. Among adolescent girls and young women in the United States, approximately 0.1% to 1% have anorexia nervosa and 1% to 3% have bulimia nervosa (BN).<sup>1,2</sup> Less is known about the prevalence of binge eating disorder (BED) among adolescents and young adults. The prevalence of eating disorders among men is not well known but is assumed to be much lower.<sup>1,3,4</sup> Swanson et al<sup>4</sup> observed that, in a study of 10 123 adolescents, BN and BED were 3 times more common among girls than boys, but the prevalence of partial-criteria BED was similar among both sexes. Moreover, BED is the most common eating disorder among adults,<sup>1</sup> and the lifetime prevalence of partial- or full-criteria BED is similar for males (1.6%) and females (2.0%).<sup>1</sup>

However, rates of eating- and weight-related disorders are probably underestimated among males. One core symptom of anorexia nervosa and BN is that weight and physique have an undue influence on a person's self-evaluation. Among females, these concerns usually present as a strong desire for thinness, but males may be more focused on muscularity. At present, the diagnostic criteria assume that the same symptoms apply to both sexes. The frequency of use of products such as anabolic steroids to increase muscle size and enhance body size are at least as common among males<sup>5-7</sup> as purging is among females,<sup>8</sup> suggesting that a willingness to take extreme measures to achieve an ideal physique may be similar between males and females but with a sex difference in the desired physique and the methods used for weight and shape control. Although the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) (*DSM-IV*) criteria<sup>9</sup> are widely used to classify individuals, the diagnoses of eating disorders were not empirically defined and may not be equally appropriate for males and females.

Among more than 8500 adolescent girls and young women in the ongoing Growing Up Today Study, previous research<sup>10</sup> found empirical support for a broader range of eating disorders than are currently captured in the *DSM-IV* or the *DSM-5*.<sup>11</sup> The aim of the present investigation was to assess the range of concerns with physique and eating disorders among males and whether these concerns predict development of adverse outcomes thought to be associated with BN in females or obesity due to binge eating. We assessed these aims using 8 follow-up assessments collected from more than 5500 males who were 12 to 18 years of age in 1999 and were followed up until 2011.

## Methods

The Growing Up Today Study was established in 1996 by recruiting children of women participating in the Nurses' Health Study II. Using the Nurses' Health Study II data, we identified mothers who had children aged 9 to 14 years. Children whose mothers gave us consent to invite them to participate were mailed an invitation letter and a questionnaire. Additional details have been reported previously.<sup>12</sup> A total of 9039 girls and 7843 boys returned completed questionnaires, thereby assenting to participate in the cohort. The participants were sent ques-

tionnaires in 1996, 1997, 1998, 1999, 2000, 2001, 2003, 2005, 2007, and 2010. The data collection periods from 2001 through 2010 spanned approximately 2 years per cycle. The study was approved by the Human Subjects Committee at Brigham and Women's Hospital, and the analyses presented in this article were approved by the institutional review boards at Brigham and Women's Hospital and Boston Children's Hospital.

## Measures

Behaviors indicative of eating disorders have been assessed on all questionnaires. Concerns about weight and physique were assessed with the McKnight Risk Factor Survey (MRFS),<sup>13</sup> an instrument designed for and evaluated with preadolescent and adolescent girls. Like girls, boys may desire low levels of body fat, but unlike girls, boys may not desire thinness. Thus, to make the MRFS more appropriate for boys, we added the following question: "In the past year, how often have you thought about wanting to have bigger muscles?" (1999) or "toned or defined muscles?" (2001-2005). The Muscularity subscale consisted of questions on wanting bigger or more defined muscles and frequency of worrying about the presence of body fat. The Desire for thinness subscale consisted of the following 3 questions: "How often have you worried about fat on your body?" "How often have you thought about wanting to be thinner?" and "How often have you felt fat?" Boys' concern about muscularity was classified as high if their mean response on the subscale was at least 4, which corresponded to responding "a lot" or "always" to the questions. Similarly, concern about thinness was classified as high if their mean response on the subscale was at least 4 (high concern).

In 1999, questions were included on the survey that asked how often the respondents used a variety of substances, including creatine and dehydroepiandrosterone supplements, growth hormone derivatives, and anabolic steroids, to improve physical appearance or to help gain weight, strength, or muscle mass. Use of these products was assessed again in 2001, 2003, 2005, and 2010. Information from 2005 was carried forward to 2007 in the analysis.

Purging was assessed by asking how often in the past year the respondent made himself vomit or used laxatives to keep from gaining weight. Binge eating was assessed with a 2-part question. Respondents were first asked about the frequency during the past year of eating a very large amount of food. Respondents who reported overeating were directed to a question that asked whether they felt out of control during these episodes, eg, unable to stop eating even if they wanted. *Binge eating* was defined as eating a very large amount of food in a short amount of time at least monthly and feeling out of control during the eating episode. The binge eating and purging questions have been validated in the Growing Up Today Study cohort.<sup>14</sup>

Because eating disorders are less common among males, we combined partial- and full-criteria cases into 1 category. Respondents who reported that they engaged in binge eating at least once per month and purged less than monthly were classified as having BED. Respondents who reported vomiting or using laxatives to control weight at least monthly and binged less than monthly were classified as having purging disorder. Respondents who engaged monthly in binge eating and purg-

ing were classified as having BN, and all respondents with BN reported high concern with thinness. Respondents who engaged in binge eating and/or purging less than monthly and those who experienced overeating episodes but did not experience a loss of control were classified as engaging in infrequent disordered eating. We augmented the eating disorder phenotypes to include the following types of concerns with physique without engaging in bulimic behaviors: high concern with muscularity; high concern with muscularity and use of supplements, growth hormone derivatives, or anabolic steroids to achieve their desired physique; high concern with thinness; and high concern with muscularity and thinness.

## Outcomes

### Weight Status

We calculated body mass index (BMI) as weight in kilograms divided by height in meters squared using self-reported weight and height assessed on all questionnaires. Among adolescents and young adults, weight change based on serial self-reported weight has been found to underestimate weight change based on measured weights by only a mean of 1.0 kg.<sup>15</sup> Height or BMI values detected as outliers<sup>16</sup> were set to missing and not used in the analysis. Children and adolescents younger than 18 years were classified as obese based on the International Obesity Task Force cutoffs.<sup>17</sup> Young men who were 18 years or older with a BMI of 30 or greater were classified as obese.

### Binge Drinking

Binge drinking was assessed in the 1999, 2000, 2001, 2003, 2007, and 2010 questionnaires. Respondents who reported that they ever consumed alcohol were asked a series of questions about their drinking. One of those questions asked about the frequency during the past year of consuming 5 or more alcoholic drinks within a few hours, which was our definition of binge drinking among males. Respondents who reported at least 12 episodes of binge drinking in the past year were classified as frequent binge drinkers.

### Drug Use

Questions on the use of drugs other than alcohol were included on the 1999, 2001, 2003, 2007, and 2010 questionnaires. Respondents were asked whether they had ever used any of the following drugs in the past year: marijuana or hashish, cocaine, crack, heroin, ecstasy, phencyclidine hydrochloride (PCP),  $\gamma$ -hydroxybutyrate (sodium oxybate; GHB), lysergic acid diethylamide (LSD), magic mushrooms, ketamine, methamphetamine (crystal meth), flunitrazepam (Rohypnol), and amphetamines. Because of an expected cross-sectional association between marijuana and hashish use with overeating episodes, we did not include marijuana or hashish in our drug use outcome. Respondents who reported using any of the other drugs and had never reported using any of those drugs at an earlier period were classified as incident drug users.

### Depressive Symptoms

In 1999, 2001, and 2003, depressive symptoms were assessed using the 6-item validated scale of the MRFS.<sup>13</sup> All responses

were scored on a 5-point Likert scale ranging from never to always. In 2007 and 2010, the Center for Epidemiologic Studies Depression Scale<sup>18,19</sup> was used instead of the MRFS. Questions from the MRFS were identical or similar to questions included in the Center for Epidemiologic Studies Depression Scale. Respondents in the top quintile of depressive symptoms were considered to have high depressive symptoms. Thus, males with incident high depressive symptoms were those who were in one of the lower 4 quintiles of depression symptoms on one assessment but in the top quintile on the next assessment.

## Sample

Respondents were excluded from the analysis if they were female or if they did not return at least 2 contiguous assessments during the study period or provide information on bulimic behaviors and concern about weight and physique, leaving 5595 males eligible for the analysis. In addition, males were excluded if they represented prevalent cases in all outcomes in 1999 or did not provide information on any of the outcomes after 1999, reducing the sample to 5527 males. In all analyses, respondents who represented prevalent cases at baseline were excluded, and once a respondent reported the outcome of interest, he was censored from analyses using subsequent periods. After these exclusions, 4748 males remained for the analyses predicting the development of obesity; 5250, the start of binge drinking at least monthly; 4031, the start of drug use; and 3441, development of high depressive symptoms.

## Statistical Analysis

We estimated the probability of the 4 main outcomes with generalized estimating equations<sup>20</sup> to account for clustering within family, using commercially available statistical software (PROC GENMOD, SAS, version 9.2; SAS Institute). Predictors were lagged so outcomes were modeled as a function of predictors from the previous time point. All analyses were adjusted for age. Known predictors of the outcomes were included as covariates in the final models. Respondents missing information were excluded from that wave of the analyses but were retained in other years when they provided complete information. These covariates varied by outcome. Dieting and BMI were included in models predicting the development of obesity; having a sibling who used drugs, at least 1 friend who used drugs, or at least 1 adult at home who drinks were adjusted for in the models predicting drug use; BMI, region of the country, and having a sibling who started drinking before 18 years of age, at least 1 friend who drinks, or at least 1 adult at home who drinks were included in models predicting binge drinking; and BMI and level of depressive symptoms at the prior assessment were adjusted for in the models predicting high depressive symptoms.

## Results

In 1999, the respondents were 11 to 18 years of age (Table 1). Less than 1% had partial or full BN, purging disorder, or BED; however, approximately 8.5% were extremely concerned with

**Table 1. Baseline Characteristics of 5527 Adolescent Boys in the Growing Up Today Study**

Characteristic	Data <sup>a</sup>
Age, mean (SD), y	14.9 (1.6)
BMI, mean (SD)	21.4 (3.8)
Overweight or obese	26.2
Frequent dieting	4.5
Region of residence	
Northeast	34.8
South	14.3
West	15.5
Midwest	35.3
High concerns with thinness but not muscle size or tone <sup>b</sup>	1.6
High concerns with muscle size or tone but not thinness <sup>b</sup>	2.8
High concerns with thinness and muscle size or tone <sup>b</sup>	2.7
High concerns with muscle size or tone and using creatine supplements, anabolic steroids, or other products to improve physique <sup>b</sup>	3.0
Partial- or full-criteria PD or BN	0.2
Partial- or full-criteria BED	0.4
Infrequent binge eating, purging, or overeating without a loss of control	7.5

Abbreviations: BED, binge eating disorder; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); BN, bulimia nervosa; PD, purging disorder.

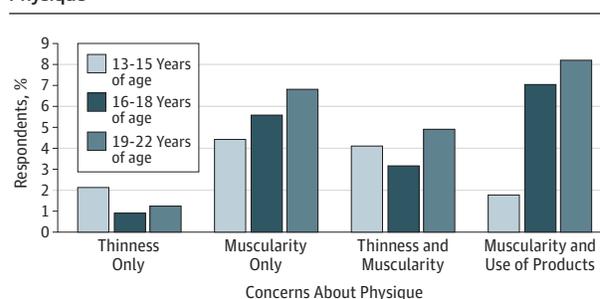
<sup>a</sup> Unless otherwise indicated, data are expressed as percentage of respondents.

<sup>b</sup> Includes respondents who were not engaged in binge eating or purging at least monthly.

their muscularity, were concerned with their muscularity and using supplements and other products to improve their physique, or were very concerned with thinness and muscularity. Concerns about muscularity with or without use of products increased with age, but concerns about thinness did not (Figure). From 1999 through 2011, 9.2% reported high concerns with muscularity; 2.4%, high concerns with muscularity and use of supplements, growth hormone derivatives, or anabolic steroids to achieve their desired physique; 2.5%, high concerns with thinness; and 6.3%, high concerns with thinness and muscularity. During the same period, 0.8% had partial- or full-criteria BN or purging disorder and 2.9%, partial- or full-criteria BED. As many as 31.0% engaged in infrequent binge eating or purging or overeating without a loss of control (data not shown).

In age-adjusted analyses, all 4 categories of weight and physique concerns predicted an increased risk of becoming obese. However, after adjusting for BMI and dieting frequency, only males with high concerns about thinness but not muscularity were more likely to become obese (odds ratio [OR], 3.21; 95% CI, 1.44-7.13) (Table 2).

In analyses predicting the start of frequent binge drinking, males with high concerns about muscularity who used potentially unhealthy products to achieve their desired physique were more likely than their peers to start binge drinking frequently (OR, 2.06; 95% CI, 1.58-2.69). In addition, males with high concerns about muscularity and thinness (OR, 2.13; 95% CI, 1.31-3.46) and those with high concerns about muscularity who used products to improve muscle size or strength (2.16;

**Figure. Age-Group-Specific Prevalence of Concerns About Weight and Physique**

Questionnaire respondents expressed high levels of concern about aspects of physique (thinness and muscularity) and whether they used appearance-enhancing products (ie, supplements, growth hormone derivatives, or anabolic steroids) more than once per month. Data are obtained from 5527 respondents in the Growing Up Today Study.

1.49-3.11) were much more likely than their peers to start using drugs (Table 2). Little evidence suggested that males with high concerns about thinness only or those with partial- or full-criteria BN, purging disorder, or BED were at increased risk of starting frequent binge drinking or drug use. However, evidence suggested that males with high concerns about muscularity who were not using dangerous products or supplements might be at increased risk.

The pattern of association between eating disorder type and the risk of developing high depressive symptoms was similar to the pattern observed for the development of obesity. Only males with high concerns about thinness but not muscularity were more likely than their peers to develop high depressive symptoms (OR, 2.72; 95% CI, 1.36-5.44). However, evidence suggested that males who engaged infrequently in bulimic behaviors or who engaged in overeating without a loss of control were also at increased risk (OR, 1.28; 95% CI, 0.99-1.67) (Table 2).

## Discussion

In this large prospective study of adolescent boys and young men, we observed that, by adulthood, approximately 2.9% had developed partial- or full-criteria BED for at least 1 year, but many more (17.9%) became extremely concerned with their weight and physique. As expected, more males wanted bigger or more toned and defined muscles rather than thinness, the concern about physique that is relatively common among females. Of particular concern is that, among 16- to 22-year-old males, 7.6% were very concerned with muscularity and using potentially unhealthy means to achieve their desired physique. These individuals may represent the male equivalent of purging disorder: instead of using extreme weight control behaviors (ie, vomiting and laxatives) to achieve a desired thin physique, they may use different extreme and possibly unhealthy behaviors (ie, use of creatine supplements, growth hormone derivatives, and anabolic steroids) to achieve a desired muscular or toned physique.

**Table 2. Prospective Association Between Eating Disorder Subtypes and Risk of Developing Adverse Outcomes From 1999 Through 2011 Among 5527 Males in the Growing Up Today Study**

Subtype	Outcome, OR (95% CI)							
	Development of Obesity		Starting to Binge Drink Frequently <sup>a</sup>		Starting to Use Drugs		Developing High Depressive Symptoms	
	Age Adjusted	Multivariate Adjusted <sup>b</sup>	Age Adjusted	Multivariate Adjusted <sup>c</sup>	Age Adjusted	Multivariate Adjusted <sup>d</sup>	Age Adjusted	Multivariate Adjusted <sup>e</sup>
Area of high concern								
Thinness only	8.13 (3.71-17.81)	3.21 (1.44-7.13)	0.55 (0.29-1.04)	0.69 (0.35-1.33)	1.32 (0.56-3.09)	0.86 (0.28-2.68)	2.67 (1.39-5.16)	2.72 (1.36-5.44)
Muscularity only	1.69 (1.02-2.80)	1.16 (0.64-2.10)	1.40 (1.06-1.84)	1.34 (0.99-1.82)	1.57 (1.12-2.18)	1.43 (0.98-2.09)	1.32 (0.90-1.94)	1.32 (0.89-1.95)
Thinness and muscularity	2.62 (1.49-4.58)	0.90 (0.47-1.73)	1.40 (1.04-1.88)	1.26 (0.89-1.80)	1.71 (1.10-2.65)	2.13 (1.31-3.46)	1.53 (0.91-2.57)	1.56 (0.90-2.71)
Muscularity with use of products <sup>f</sup>	1.99 (1.31-3.00)	1.30 (0.79-2.13)	2.04 (1.59-2.61)	2.06 (1.58-2.69)	1.98 (1.42-2.77)	2.16 (1.49-3.11)	1.13 (0.77-1.66)	1.19 (0.81-1.75)
Disordered eating								
Partial- or full-criteria PD or BN	2.27 (0.27-18.75)	1.37 (0.20-9.43)	0.96 (0.32-2.91)	0.96 (0.30-3.10)	1.54 (0.39-6.12)	2.05 (0.49-8.63)	2.85 (0.66-12.33)	2.80 (0.84-9.34)
Partial- or full-criteria BED	1.09 (0.29-4.09)	0.57 (0.17-1.99)	1.04 (0.55-1.98)	0.67 (0.30-1.49)	1.62 (0.72-3.63)	1.76 (0.73-4.24)	0.93 (0.27-3.13)	0.93 (0.27-3.15)
Infrequent disordered eating without loss of control	1.38 (1.00-1.91)	1.18 (0.78-1.77)	1.15 (0.96-1.37)	1.09 (0.89-1.33)	1.07 (0.82-1.39)	0.97 (0.72-1.31)	1.30 (1.00-1.68)	1.28 (0.99-1.67)

Abbreviations: BED, binge eating disorder; BN, bulimia nervosa; PD, purging disorder; OR, odds ratio.

<sup>a</sup> Indicates at least 12 times per year.

<sup>b</sup> Lagged analysis using generalized estimating equations (GEEs), adjusted for age, body mass index (BMI), and dieting.

<sup>c</sup> Lagged analysis using GEEs, adjusted for age, BMI, and region of the country and having a sibling who started drinking before age 21 years, at least 1 friend who drinks, or at least 1 adult at home who drinks.

<sup>d</sup> Lagged analysis using GEEs, adjusted for age and region of the country and having a sibling who uses drugs, at least 1 friend who uses drugs, or at least 1 adult at home who drinks.

<sup>e</sup> Lagged analysis using GEEs, adjusted for age, BMI, and level of depressive symptoms at the prior assessment.

<sup>f</sup> Includes supplements, growth hormone derivatives, or anabolic steroids.

Muscularity concerns increased with age. Boys who had high concerns about muscularity and used products to improve their physique were more likely than their peers to start using drugs and binge drinking frequently. In addition, boys with these concerns who were not using potentially unhealthy means to achieve their desired physique were at a slightly lower increased risk of these adverse outcomes. Our results suggest that the failure of most eating disorder assessments to measure concerns with muscularity may result in overlooking a substantial number of males with a potential eating disorder. In the *DSM-IV* and *DSM-5*, eating disorders are grouped as disorders characterized by aberrant eating behaviors (not eating with anorexia nervosa and overeating with BN and BED) in the context of weight- and physique-related cognitions (eg, fat phobia or overvaluation). However, our results suggest that the focus should be the cognitive symptoms, namely, the undue influence of weight and physique on self-evaluation, which may be the driver of the aberrant eating or other unhealthy behaviors. Recognizing the clinical relevance of cognitive symptoms (even in the absence of aberrant eating or behaviors to enhance physique) would promote detection of an eating disorder presentation characterized by preoccupation with having larger, toned, or more defined muscles and using potentially

unhealthy strategies to achieve the desired physique. Sex differences are well described in the presentation of other psychiatric disorders, such as attention-deficit/hyperactivity disorder, and we believe that future revisions to the diagnostic criteria should allow for a sex difference in presentation of eating disorders.

Because our cohort is more than 90% white and we have relatively few respondents of a low socioeconomic status, we cannot be clear whether the results are generalizable to males of color or from a lower socioeconomic level. Also, we used validated self-report questionnaires to assess eating disorder behaviors and cognitions. Thus, we may have slightly overestimated the number of cases of eating disorder and slightly underestimated the associations with adverse outcomes. In addition, although we have collected information on a variety of types of physical activity, we have not measured whether the respondents play on sports teams. However, the study strengths easily outweigh these limitations. This study is, to our knowledge, the largest longitudinal sample of males with repeated assessments of eating disorder and weight and physique concerns. Moreover, it is the first study to prospectively examine the association between eating disorder subtypes, including high concerns with muscularity, and the risk of developing a range of adverse outcomes.

In summary, we observed that by late adolescence and young adulthood, 7.6% of males were extremely focused on wanting more toned or defined muscles and using potentially unhealthy products at least monthly to improve their physique. This large group has been understudied in research and may be entirely missed by health care providers because they are not captured by the *DSM-IV* or the *DSM-5* diagnostic criteria for eat-

ing disorders. The *DSM-5* criteria represent a large improvement, but future revisions will need to expand the diagnoses to better capture presentations more common among males. Until then, health care providers need to be made aware of this large group of males. We encourage researchers to conduct studies on this issue so that it may become better understood before the next *DSM* task force begins revisions on the diagnostic criteria.

#### ARTICLE INFORMATION

**Accepted for Publication:** May 6, 2013.

**Published Online:** November 4, 2013.  
doi:10.1001/jamapediatrics.2013.2915.

**Author Affiliations:** Division of Adolescent/Young Adult Medicine, Department of Medicine, Boston Children's Hospital, Boston, Massachusetts (Field, Sonneville); Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital, Boston, Massachusetts (Field, Camargo); Department of Epidemiology, Harvard School of Public Health, Boston, Massachusetts (Field, Swanson, Camargo); Department of Pediatrics, Harvard Medical School, Boston, Massachusetts (Field, Sonneville); Department of Medicine, Harvard Medical School, Boston, Massachusetts (Field, Camargo); Neuropsychiatric Research Institute and Department of Clinical Neuroscience, University of North Dakota School of Medicine and Health Sciences, Fargo (Crosby); Department of Psychiatry, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts (Eddy); Department of Emergency Medicine, Massachusetts General Hospital, Boston (Camargo); Department of Mathematics and Statistics, Smith College, Northampton, Massachusetts (Horton); Behavioural and Brain Sciences Unit, Institute of Child Health, University College London, London, England (Micali).

**Author Contributions:** Drs Field and Horton had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Field, Sonneville, Horton, Micali.

**Acquisition of data:** Field, Camargo.

**Analysis and interpretation of data:** Field, Crosby, Swanson, Eddy, Camargo, Horton, Micali.

**Drafting of the manuscript:** Field.

**Critical revision of the manuscript for important intellectual content:** Sonneville, Crosby, Swanson, Eddy, Camargo, Horton, Micali.

**Statistical analysis:** Field, Crosby, Swanson, Horton.

**Obtained funding:** Field, Micali.

**Administrative, technical, and material support:** Sonneville.

**Conflict of Interest Disclosures:** None reported.

**Funding/Support:** Data collection for this study was supported by research grants MH087786, DK59570, DK46200, HL68041, and HDO49889 from the National Institutes of Health (NIH).

Analysis for this study was supported by grant MH087786 from the NIH.

**Role of the Sponsor:** The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

**Additional Contributions:** We thank the thousands of participants in the Growing Up Today Study and their mothers.

#### REFERENCES

- 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.
- American Psychiatric Association Work Group on Eating Disorders. Practice guideline for the treatment of patients with eating disorders (revision). *Am J Psychiatry*. 2000;157(1)(suppl):1-39.
- Patton GC, Selzer R, Coffey C, Carlin JB, Wolfe R. Onset of adolescent eating disorders: population based cohort study over 3 years. *BMJ*. 1999;318(7186):765-768.
- Swanson SA, Crow SJ, Le Grange D, Swendsen J, Merikangas KR. Prevalence and correlates of eating disorders in adolescents: results from the National Comorbidity Survey replication adolescent supplement. *Arch Gen Psychiatry*. 2011;68(7):714-723.
- vandenBerg P, Neumark-Sztainer D, Cafri G, Wall M. Steroid use among adolescents: longitudinal findings from Project EAT. *Pediatrics*. 2007;119(3):476-486.
- National Institute on Drug Abuse. *Anabolic Steroid Abuse*. Bethesda, MD: US Dept of Health and Human Services, National Institutes of Health; 2006.
- Eisenberg ME, Wall M, Neumark-Sztainer D. Muscle-enhancing behaviors among adolescent girls and boys. *Pediatrics*. 2012;130(6):1019-1026.
- Field AE, Javaras KM, Aneja P, et al. Family, peer, and media predictors of becoming eating disordered. *Arch Pediatr Adolesc Med*. 2008;162(6):574-579.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. ed 4. Washington, DC: American Psychiatric Association; 1994.
- Field AE, Sonneville KR, Micali N, et al. Prospective association of common eating disorders and adverse outcomes. *Pediatrics*. 2012;130(2):e289-e295.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Arlington, VA: American Psychiatric Association; 2013.
- Field AE, Camargo CA Jr, Taylor CB, Berkey CS, Roberts SB, Colditz GA. Peer, parent, and media influences on the development of weight concerns and frequent dieting among preadolescent and adolescent girls and boys. *Pediatrics*. 2001;107(1):54-60.
- Shisslak CM, Renger R, Sharpe T, et al. Development and evaluation of the McKnight Risk Factor Survey for assessing potential risk and protective factors for disordered eating in preadolescent and adolescent girls. *Int J Eat Disord*. 1999;25(2):195-214.
- Field AE, Taylor CB, Celio A, Colditz GA. Comparison of self-report to interview assessment of bulimic behaviors among preadolescent and adolescent girls and boys. *Int J Eat Disord*. 2004;35(1):86-92.
- Field AE, Aneja P, Rosner B. The validity of self-reported weight change among adolescents and young adults. *Obesity (Silver Spring)*. 2007;15(9):2357-2364.
- Rosner B. Percentage points for a generalized ESD many-outlier procedure. *Technometrics*. 1983;25(2):165-172.
- Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ*. 2000;320(7244):1240-1243.
- Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prev Med*. 1994;10(2):77-84.
- Radloff L. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1:385-401.
- Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. *Biometrics*. 1986;42(1):121-130.