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## Prevalence, Incidence, Impairment, and Course of the Proposed DSM-5 Eating Disorder Diagnoses in an 8-Year Prospective Community Study of Young Women

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### Abstract

We examined the prevalence, incidence, impairment, duration, and course for the proposed DSM-5 eating disorders in a community sample of 496 adolescent females who completed annual diagnostic interviews over 8-years. Lifetime prevalence by age 20 was 0.8% for anorexia nervosa (AN), 2.6% for bulimia nervosa (BN), 3.0% for binge eating disorder (BED), 2.8% for atypical AN, 4.4% for subthreshold BN, 3.6% for subthreshold BED, 3.4% for purging disorder (PD); with a combined prevalence of 13.1% (5.2% had AN, BN, or BED; 11.5% had a Feeding and Eating Disorders Not Elsewhere Classified; FED-NEC). Peak age of onset was 19-20 for AN, 16-20 for BN, and 18-20 for BED, PD, and overall FED-NEC. Youth with these eating disorders typically reported greater functional impairment, distress, suicidality, mental health treatment, and unhealthy BMIs, though effect sizes were relatively smaller for atypical AN, subthreshold BN, and PD. Average episode duration in months ranged from 2.9 for BN to 11.2 for atypical AN. One-year remission rates ranged from 71% for atypical AN to 100% for BN, subthreshold BN, and BED. Recurrence rates ranged from 6% for PD to 33% for BED and subthreshold BED. Diagnostic progression from subthreshold to threshold eating disorders was higher for BN and BED (32% and 28%) than for AN (0%), suggesting some sort of escalation mechanism for binge eating. Diagnostic crossover was greatest from BED to BN. Results imply that the new DSM-5 eating disorder criteria capture clinically significant psychopathology and usefully assign eating disordered individuals to homogeneous diagnostic categories.

### Keywords

DSM-5 eating disorders; prevalence; incidence; duration; remission; recurrence; diagnostic crossover

Over 10% of young women meet criteria for DSM-IV anorexia nervosa (AN), bulimia nervosa (BN), or eating disorder not otherwise specified (EDNOS), which includes binge eating disorder (BED) and subthreshold eating disorders (Hudson, Hiripi, Pope, & Kessler, 2007; Stice, Marti, Shaw, & Jaconis, 2009; Wade, Bergin, Tiggemann, Bulik, & Fairburn, 2006). Both threshold eating disorders and EDNOS are marked by chronicity, relapse, distress, functional impairment, and risk for future obesity, depression, suicide attempts, anxiety disorders, substance abuse, and morbidity (Crow et al., 2009; Fairburn, Cooper, Doll, Norman, & O'Connor, 2000; Keel, Mitchell, Miller, Davis, & Crow, 1999; Mond et al., 2006; le Grange et al., 2006; Schmidt et al., 2008; Stice, Marti, Spoor, Presnell, & Shaw, 2008; Striegel-Moore, Seeley, & Lewinsohn, 2003; Swanson, Crow, le Grange, Swendsen, & Merikangas, 2011). The standardized mortality ratio (observed deaths in a population/

expected deaths based on demographics) is 5.9 for anorexia nervosa and 1.9 for bulimia nervosa and EDNOS (Arcelus, Mitchell, Wales, & Nielsen, 2011). The standardized mortality ratio from suicide is 4.7 for anorexia nervosa, 6.5 for bulimia nervosa, and 3.9 for EDNOS (Crow et al., 2009). Indeed, eating disorders show stronger relations to suicide attempts, outpatient and inpatient treatment, and functional impairment than virtually all other psychiatric disorders (Newman et al., 1996).

Although the DSM-IV eating disorder diagnoses were an improvement over previous diagnostic criteria for eating disorders because they provided more precise behavioral criteria, over half of individuals seeking eating disorder treatment receive an EDNOS diagnosis (Eddy, Celio, Hoste, Herzog, & le Grange, 2008; Fairburn & Bohn, 2005; Fisher, Schneider, Burns, Symons, & Mandel, 2001). Further, individuals with EDNOS diagnoses often do not differ significantly from those with threshold eating disorders on functional impairment (Keel, Brown, Holm-Denoma, & Bodell, 2011; Stice et al., 2009; Thomas, Vartanian, & Brownell, 2009). Thus, for DSM-5 the American Psychiatric Association Task Force proposed several changes to eating disorder diagnoses (see <http://www.dsm5.org>). First, they reduced the frequency requirement for binge eating and compensatory behaviors for BN from twice to once weekly. Second, they reduced the frequency requirement for binge eating for BED from twice to once weekly and reduced the duration of binge eating requirement from 6- to 3-months. These changes were based on the evidence that individuals who report binge eating twice weekly versus less frequently do not show differential impairment (Spoor, Stice, Burton, & Bohon, 2007; Wilson & Sysko, 2009). Third, they now recognize BED as a formal eating disorder based on evidence of the validity and clinical utility of this diagnosis (Wonderlich, Gordon, Mitchell, Crosby, & Engel, 2009). Fourth, they eliminated amenorrhea as a diagnostic symptom for AN because of the lack of empirical support for the utility of this symptom (Attia & Roberto, 2009). Fifth, they added new conditions under the FED-NEC category, including atypical AN, subthreshold BN, subthreshold BED, and PD. Thus, the proposed changes for DSM-5 refine the diagnostic criteria for AN, BN, and BED and introduced new conditions that are more homogeneous than the previous general EDNOS category.

Given that the new diagnostic criteria for DSM-5 have only been recently proposed, there are several important unanswered questions regarding these diagnoses. First, there are limited data on the prevalence and incidence of the newly proposed DSM-5 eating disorders. One study projected the lifetime prevalence of the newly proposed DSM-5 definition of binge eating disorder based on data from a sample of relatives of individuals with eating disorders; they estimated that 3.6% of women and 2.1% of men would meet the DSM-5 criteria for BED (Hudson, Coit, Lalonde, & Pope, 2012). Several studies have reported that the lifetime prevalence of PD ranged from 1.1% to 5.3% (see Keel, 2007 for a review), though these studies were published before the proposed DSM-5 definitions of eating disorders appeared and it is not clear that they captured the DSM-5 definition of PD because many of the newly proposed FEDNEC conditions were not clearly specified, such as the required frequency of compensatory behaviors for PD. The absence of clear operational criteria has likely contributed to the variability in definitions and resulting prevalence estimates for PD. We were unable to locate any studies that examined community samples to determine the prevalence and incidence of the remaining DSM-5 eating disorders. Second, it is also important to investigate the peak periods of risk for onset of the DSM-5 eating disorders, as it should provide direction concerning the optimal timing of screening efforts to identify individuals with eating disorders, prospective eating disorder risk factor studies, and eating disorder prevention programs. These data may also advance etiologic models for these disorders by implicating a role of certain developmental transitions (e.g., menarche or school transitions). Thus, Aim 1 is to investigate the prevalence, annual incidence, and peak periods of onset for the proposed DSM-5 eating disorders. We used data

from a large community study of 496 adolescent females who were assessed annually from age 13 to 21 using semi-structured interviews, which are considered the most valid and reliable diagnostic procedure (Kessler et al., 2004).

Third, there are limited data on whether the newly proposed DSM-5 eating disorders are each associated with functional impairment. One study found that participants who met lifetime criteria for DSM-5 AN, BN, BED, and broadly-defined EDNOS generally showed elevated lifetime major Axis I psychiatric disorders (mood, anxiety, substance use, and impulse control disorders), suicidality, functional impairment, and psychiatric treatment history (Keel et al., 2011). Studies have found that individuals with PD report significantly greater functional impairment, mental health treatment, distress, depressive symptoms, anxiety symptoms, and general psychiatric comorbidity than women without a history of eating disorders (Keel, Haedt, & Edler, 2005; Keel, Wolfe, Gravener, & Jimerson, 2007; Stice et al., 2009; Wade et al., 2006). However, we were unable to locate additional research on the functional impairment associated with other proposed DSM-5 eating disorders, including AN, BN, BED, atypical AN, subthreshold BN, and subthreshold BED. Thus, Aim 2 is to test whether participants with each of the DSM-5 eating disorders show functional impairment, emotional distress, suicidality, mental health treatment, and unhealthy body mass versus those without a DSM-5 eating disorder.

Fourth, no research has examined the course of DSM-5 eating disorders. Aim 3 is therefore to report on the average duration of DSM-5 eating disorders, remission, and recurrence rates for these conditions, the proportion of subthreshold cases that progress to full threshold status (diagnostic progression), and crossover from one eating disorder diagnosis to another (diagnostic crossover). These data have the potential of further establishing the clinical validity of the new DSM-5 eating disorder diagnostic system.

In sum, we examined the lifetime prevalence and annual incidence of DSM-5 eating disorders by age 20 and the peak periods of risk for onset of these disorders (Aim 1); whether individuals with DSM-5 eating disorders show impairment relative to eating disorder-free youth in terms of functioning, emotional distress, suicidality, mental health treatment, and an unhealthy body mass (Aim 2); and the episode duration, remission rates, recurrence rates, diagnostic progression, and diagnostic crossover for DSM-5 eating disorders (Aim 3). We addressed these questions with data from a prospective risk factor study that followed a community sample of 496 female adolescents over an 8-year period from early adolescence to young adulthood. We focused on this age-range because data suggest that the peak period of risk for eating pathology onset occurs during this developmental window (Lewinsohn et al., 2000). We focused on females because they are much more likely to develop eating disorders than males (Hudson et al., 2007). We sought to address gaps in the literature by using sensitive semi-structured diagnostic interviews on an annual basis over this critical developmental period. We analyzed this same data set in an earlier paper on DSM-IV eating disorders (Stice et al., 2009), thereby permitting a direct comparison of the two diagnostic approaches.

## Methods

### Participants and Procedures

Participants were 496 adolescent girls in a large US city recruited from schools. At baseline, participants ranged from 12 to 15 years of age ( $M = 13$ ) and were in 7<sup>th</sup> or 8<sup>th</sup> grade. The sample included 2% Asian/Pacific Islanders, 7% African Americans, 68% Caucasians, 18% Hispanics, 1% Native Americans, and 4% who specified other/mixed racial heritage, which was representative of the schools. Average parental education, a proxy for socioeconomic

status, was 29% high school graduate or less, 23% some college, 33% college graduate, and 15% graduate degree, which was representative of the city from which we sampled.

The study was described as an investigation of adolescent mental and physical health. They were recruited through an informed consent letter sent to parents of eligible girls (a second mailing was sent to non-responders). This resulted in a participation rate of 56%, which was similar to other school-recruited samples that used active consent procedures, structured interviews, and longitudinal follow-up (e.g., 61% for Lewinsohn et al., 2000). Female assessors with at least a bachelor's degree in psychology conducted semi-structured interviews that assessed eating disorder symptoms and recorded participant's weight and height at baseline and seven subsequent years (T1 - T8). Assessors attended 24 hours of training in which they received instruction in structured interview skills, reviewed diagnostic criteria for relevant DSMIV disorders, observed simulated interviews, and role-played interviews. Assessors were required to demonstrate an inter-rater agreement ( $k > .80$ ) with supervisors on tape-recorded interviews prior to collecting data. Assessments took place at schools, participants' houses, or the research offices. Participants received a gift certificate or cash payment for completing each assessment. The local Institutional Review Board approved this study.

## Measures

**Eating pathology**—The Eating Disorder Diagnostic Interview (EDDI: Stice et al., 2008), a semi-structured interview, assessed eating disorder symptoms over the 12-month period prior to each annual diagnostic interview. Because the task force did not clearly operationalize most of the FED-NEC conditions, we made the following operational decisions (see Table 1). For atypical AN we required that individuals showed at least a 10% reduction in BMI from a previously measured BMI, which appears to be the average weight loss that occurs in response to behavioral weight loss interventions. For subthreshold BN we required that individuals reported at least 2 binge eating and 2 compensatory behavior episodes per month for at least 3 months or at least 6 episodes over a shorter period. For subthreshold BED we required that individuals reported at least 2 binge eating episodes per month for at least 3 months or at least 6 episodes over a shorter period and less than 1 compensatory behavior episode per month over this period. We reduced the frequency criteria for binge eating and compensatory behaviors for subthreshold BN and BED by half of that required for a full threshold diagnosis of BN and BED. For PD we required that individuals report at least 4 episodes of purging behaviors per month over the last 3 months and report less than 1 binge eating episode per month over this period, paralleling the operationalization used by Keel and Striegel-Moore (2009). Excessive exercise was defined as at least 1-hr of vigorous exercise or 2-hrs of moderate exercise expressly to compensate for overeating. Fasting was defined as skipping at least 2 meals in a row with no other caloric intake for compensatory purposes. To be classified as a non-eating disordered comparison participant, we required participants to not endorse more than 2 symptoms listed in Table 1 during any single month of the follow-up period. For symptoms with threshold and subthreshold levels, we used the subthreshold level.

Test-retest reliability was assessed by randomly selecting a subset of 184 participants who were interviewed by the assessors and then re-interviewed by the same assessor within a week; the test-retest reliability was  $\kappa = .79$  for DSM-5 eating disorders. Inter-rater agreement for the eating disorder diagnoses was assessed by randomly selecting subset of 207 participants who were re-interviewed by a second blinded assessor; the inter-rater agreement was  $\kappa = .75$  for DSM-5 eating disorders. The EDDI has been shown to be sensitive to detecting intervention effects and has shown predictive validity for future onset of depression (Burton & Stice, 2006; Seeley, Stice, & Rohde, 2009; Stice et al., 2008).

**Functional impairment**—Impairment in the family, peer group, romantic, and school spheres was measured with 17 items from the Social Adjustment Scale-Self Report for Youth (Weissman, Orvaschel, & Padian, 1980) (response options: 1 = *never* to 5 = *always*). The original scale has shown convergent validity with clinician and collateral ratings ( $M r = .72$ ), discriminates between psychiatric patients and controls, and is sensitive to treatment effects (Weissman & Bothwell, 1976). The 17-item version has shown internal consistency ( $\alpha = .77$ ) and 1-week test-retest reliability ( $r = .83$ ; Stice et al., 2008).

**Emotional distress**—An item from the depression module of the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS; Puig-Antich & Chambers, 1983) assessed subjective distress (In the last 12 months did you have a period of time when you felt sad, bad, unhappy, empty, or like crying for most of the day nearly every day?). Participants reported their level of distress on a month-to-month basis over the 12-month reporting window using a response option ranging from 1 = *not at all* to 4 = *severe*. This question showed 1-week test-retest reliability ( $r = .81$ ) in the randomly selected subset of 137 participants who were interviewed twice by independent assessors. In support of the construct validity of this interview-based item, this item correlated ( $r = .53$ ) with the Kessler Psychological Distress Scale (Kessler et al., 2003) in a pilot study ( $N = 22$ ) and with the Social Adjustment Scale ( $r = .43$ ; Weissman et al., 1980) in the present sample.

**Suicidality**—An item from the depression module of the K-SADS assessed suicidality (Did you feel so bad that you think about death or dying?). Youth reported their suicidality on a month-to-month basis over the 12-month reporting window using a response option ranging from 1 = *not at all* to 4 = *severe*. This question showed 1-week test-retest reliability ( $r = .95$ ) among participants who were interviewed twice by the same assessor ( $n = 137$ ). Adolescents with versus without major depression in this sample reported higher scores on this suicidality item ( $r = .47$ ), supporting the construct validity of this item. As additional evidence for the construct validity of this interview item, it correlated ( $r = .69$ ) with the Suicide Behaviors Questionnaire-Revised (Osman et al., 2001) in a pilot study ( $N = 22$ ).

**Mental health service utilization**—Use of mental health services was assessed as the frequency of visits to mental health care providers (e.g., How often have you seen a psychologist, psychiatrist or other counselor/therapist because of mental health problems in the last 6 months?). This item showed 1-year test-retest reliability ( $r$ ) of .89 and is sensitive to intervention effects (Stice, Shaw, Burton, & Wade, 2006).

**Body mass**—The body mass index ( $BMI = kg/m^2$ ; Pietrobelli et al., 1998) was used for threshold AN diagnoses, determining whether participants showed a 10% reduction in BMI for atypical AN, and determining if diagnostic groups were under- or over-weight. Height was measured to the nearest millimeter using portable stadiometers. Weight was assessed to the nearest 0.1 kg using digital scales with participants wearing light indoor clothing without shoes or coats. Height and weight were measured twice each and averaged. The BMI has shown convergent validity ( $r = .80 - .90$ ) with direct measures of body fat such as dual energy x-ray absorptiometry (Pietrobelli et al., 1998). Age- and sex-adjusted BMI centiles from the Centers for Disease Control (Faith, Saelens, Wilfley, & Allison, 2001) were used to determine whether participants were underweight for AN diagnoses.

## Overview of Statistical Analyses

We first report the lifetime prevalence for AN, BN, BED, atypical AN, subthreshold BN, subthreshold BED, and PD, which reflect the number of participants who met criteria at baseline or exhibited onset of these disorders during follow-up. We refer to this as lifetime prevalence by age 20 because the mean age of participants at T8 was 20. We also calculated

the cumulative 8-year incidence for each disorder, which reflect the number of youth who showed onset during the 8-year follow-up, excluding those who met criteria at baseline. We also report the incidence per 100,000 person years and describe the average monthly frequency of core symptoms for the various eating disorders.

We next estimated mixed models in which the participant was treated as a random effect and wave of the study was included as a covariate to compare functional impairment, emotional distress, suicidality, mental health treatment, and BMI scores during DSM-5 eating disorders episodes with participants that did not meet criteria for any eating disorder or report more than two eating disorder symptoms during follow-up. Models included all available data from the 8 assessments. We estimated effect sizes (Cohen's *d*) by dividing the coefficients for group differences by the raw *SD* of the outcome following Feingold's (2009) suggestion for group difference effect sizes in longitudinal mixed models.

We report the incidence for onset of DSM-5 eating disorders, individual FED-NEC conditions, and the overall FED-NEC category. We derived non-cumulative hazard curves of annual incidence for onset of the eating disorders and for the FED-NEC category for ages 14 to 20 data to assess the peak period of risk for onset of each disorder. We also show hazard curves in which we combined atypical/subthreshold and threshold cases for AN, BN, and BED because it provide a less variable indication of peak periods of risk, allowing us to have more confidence in the accuracy of these descriptive data.

Next, we reported the average episode duration in months for each eating disorder, remission rates at 1- and 2-year follow-up, and recurrence rates over follow-up. An episode was defined as the length of the period in which a participant met all diagnostic criteria for an eating disorder in sequential months. Remission was defined as not meeting all criteria for an eating disorder for at least a 1-month period, following Agras, Walsh, Fairburn, Wilson, and Kraemer (2000). Recurrence was defined as meeting criteria for another episode of the same eating disorder after exhibiting remission for at least one month. We examined the possibility that mental health treatment predicted remission and episode duration in a logistic regression and linear regression model respectively. We used the measure of mental health treatment from the year in which participants first exhibited onset of an eating disorder. We also report the frequency of converting from one eating disorder category to another (diagnostic crossover). Those who showed the same diagnostic progression (e.g., transitioned from subthreshold BN to BN) or crossover on more than one occasion were counted only once. Participants who showed different types of diagnostic crossover were counted once for each type of crossover.

## Results

### Attrition

Between 2% and 10% of participants did not provide data at one or more of the follow-up assessments, although 99% of participants provided data at baseline and at least one additional assessment. Data for missing surveys and interviews are presented in Table 2. There were no significant relations between missing data and any of the eating disorder diagnoses.

### Prevalence and Incidence of Eating Disorders

Table 3 contains the lifetime prevalence of DSM-5 eating disorders by age 20, the cumulative incidence of onset during the 8-year follow-up, the incidence per 100,000 person years, and the annual prevalence (the number of participants exhibiting a disorder during each year of the follow-up) for each diagnosis and condition. The lifetime prevalence by age

20 ranged from 0.8% for AN to 4.4% for subthreshold BN. Overall, 13.1% of adolescents experienced at least one eating disorder during the 8-year follow-up (5.2% experienced AN, BN, or BED, while 11.5% experienced a FED-NEC condition [these are not mutually exclusive]).

Among individuals with AN, the mean monthly number of binge eating episodes was 0.5 ( $SD = 0.9$ ) and the mean monthly number of compensatory behavior episodes was 12.5 ( $SD = 7.2$ ); the corresponding numbers for atypical AN were 0.3 ( $SD = 0.7$ ) and 9.8 ( $SD = 11.4$ ), respectively. Among individuals with BN, the mean monthly number of binge eating episodes was 8.5 ( $SD = 5.3$ ) and the mean monthly number of compensatory behavior episodes was 10.2 ( $SD = 7.4$ ); the corresponding numbers for subthreshold BN were 2.7 ( $SD = 1.7$ ) and 7.5 ( $SD = 7.6$ ), respectively. Among those with BED, the mean monthly number of binge eating episodes was 6.3 ( $SD = 5.4$ ) and the mean monthly number of compensatory behavior episodes was 0.01 ( $SD = 0.03$ ); the corresponding numbers for subthreshold BED were 2.8 ( $SD = 2.1$ ) and 0.0 ( $SD = 0.0$ ), respectively. Among those with PD, the mean monthly number of binge eating episodes was 0.02 ( $SD = 0.07$ ) and the mean monthly number of compensatory behavior episodes was 22.8 ( $SD = 12.8$ ); the mean number of vomiting episodes per month was 12.5 ( $SD = 12.9$ ) and the mean number of diuretic/laxative episodes per month was 5.5 ( $SD = 9.1$ ). Among the non-eating disordered participants, which we defined as not meeting diagnostic criteria for an eating disorder at any assessment and exhibiting 2 or fewer of the symptoms for DSM-5 eating disorders listed in Table 1 at any point in the study<sup>1</sup> ( $n = 365$ ), the mean monthly number of binge eating episodes was 0.05 ( $SD = 0.34$ ) and the mean monthly number of compensatory behavior episodes was 0.45 ( $SD = 1.11$ ). A review of the symptoms endorsed by participants who did not meet criteria for a DSM-5 eating disorder did not reveal any consistent themes of eating disorder syndromes that were missed with the DSM-5 criteria as operationalized in this report.

## Impairment

Means, SDs, effect sizes, and p-values for functional impairment, emotional distress, suicidality, mental health treatment, and BMI are presented in Table 4. We conducted power analyses to determine which contrasts we had a power of .80 to detect medium ( $d = .50$ ) and large ( $d = .80$ ) effect sizes based on the observed cell sizes ( $\alpha = .05$ ). We had a power of .80 to detect large effects for all eating disorder groups except AN. We had a power of .80 to detect medium effects for analyses involving FED-NEC participants. Fortunately, analyses revealed that we in fact had power to detect significant effects for all of the eating disorder categories (Table 4) because many of the effects were large. However, we note the three instances when medium effects ( $d = .40 - .60$ ) did not reach statistical significance.

Participants with AN reported significantly greater functional impairment and mental health treatment and had significantly lower BMI scores than participants without eating disorders; the effect for emotional distress was a medium effect size, but did not reach significance. Participants with BN and BED reported significantly greater functional impairment, emotional distress, suicidality, and mental health treatment than non-eating disordered participants. Participants with FED-NEC reported significantly greater functional impairment, emotional distress, suicidality, and mental health treatment than non-eating disordered participants. Participants with atypical AN reported significantly greater functional impairment, emotional distress, and suicidality than non-eating disordered participants. Participants with subthreshold BN reported significantly greater functional

<sup>1</sup>We counted criteria for either binge episodes or binge days as a single symptom and either compensatory episodes (fasting or excessive exercise) or purging episodes (self-induced vomiting or diuretic/laxative use) as a single symptom as their definitions overlap, producing significant redundancy with correlations of .97 and .62 respectively. For symptoms with a subthreshold criterion, it was used.

impairment, emotional distress, suicidality, and mental health treatment than non-eating disordered participants. Participants with subthreshold BED reported significantly greater emotional distress and suicidality than non-eating disordered participants; there were medium effects for functional impairment and mental health treatment that did not reach significance. Participants with PD reported significantly greater emotional distress and suicidality than non-eating disordered participants.

### Peak Period of Onset

Figure 1 presents the annual incidence for each eating disorder separately and also combined across threshold and subthreshold variants of each eating disorder type. We excluded participants who met diagnostic criteria for an eating disorder at baseline because we could not reliably determine age of onset for these individuals. Excluding those with baseline eating disorders, 18 participants showed onset of atypical/threshold AN, 21 showed onset of subthreshold/threshold BN, 20 showed onset of subthreshold/threshold BED, 17 showed onset of PD, and 53 showed onset of a FED-NEC disorder. The peak ages for onset was between 19 and 20 for atypical/threshold AN, between 16 and 20 for subthreshold/threshold BN, and between 18 and 20 for subthreshold/threshold BED, PD, and any FED-NEC condition.

### Episode Duration

We only examined data for years 2 through 8 in this analysis because we did not collect retrospective reports of the length of episodes for cases in year 1. The average episode duration was 8.0 ( $SD = 4.8$ , range = 3-13) months for AN, 2.9 ( $SD = 1.6$ , range = 1-6) months for BN, and 3.3 ( $SD = 4.4$ , range = 1-18) months for BED. The average duration for any FED-NEC disorder was 5.9 ( $SD = 5.4$ , range = 1-22) months. Among FED-NEC conditions, the average episode duration was 11.6 ( $SD = 6.7$ , range = 1-22) months for atypical AN, 3.5 ( $SD = 3.3$ , range = 1-11) months for subthreshold BN, 3.0 ( $SD = 2.9$ , range = 1-10) months for subthreshold BED, and 5.0 ( $SD = 2.8$ , range = 1-12) months for PD. There was not a significant relation between mental health treatment and episode duration ( $t(46) = -1.17, p = .248$ ).

### Remission and Recurrence

The majority of diagnosed cases showed remission within 1 year. Three out of the 4 participants (75%) with AN showed remission within 1 year, 13 out of the 13 participants (100%) with BN showed remission within 1 year, and 14 out of the 15 participants (93%) with BED showed remission within 1 year. Fifty-one out of the 57 (89%) FED-NEC cases showed remission within 1 year. Ten out of the 14 participants (71%) with atypical AN showed remission within 1 year, 22 out of the 22 participants (100%) with subthreshold BN showed remission within 1 year, 18 out of the 18 participants (100%) with subthreshold BED showed remission within 1 year, and 16 out of the 17 individuals (94%) with PD showed remission in 1 year. Remission rates were 100% for each diagnostic category by 2-year follow-up with the exception of one BED case. There was not a significant relation between mental health treatment and remission  $\chi^2 = 1.01, p = .315$ .

Recurrence rates are based on small samples but are provided given the absence of these data in the literature. Among the 4 participants who exhibited AN, 3 experienced 1 episode and 1 experienced 2 episodes, producing an overall recurrence of 25%. Among the 13 participants who exhibited BN, 10 experienced 1 episode, 2 experienced 2 episodes, and 1 experienced 4 episodes, producing an overall recurrence of 23%. Among the 15 participants who exhibited BED, 10 experienced only 1 episode, 4 experienced 2 episodes, and 1 experienced 3 episodes, producing an overall recurrence of 33%. Among the 57 participants who exhibited any FEDNEC condition, 42 experienced 1 episode, 7 experienced 2 episodes,

5 experienced 3 episodes, 2 experienced 4 episodes, and 1 experienced 6 episodes, producing an overall recurrence of 26%. Among the 14 participants who exhibited atypical AN, 11 experienced 1 episode and 3 experienced 2 episodes, producing an overall recurrence of 21%. Among the 22 participants who exhibited subthreshold BN, 16 experienced 1 episode, 2 experienced 2 episodes, 3 experienced 3 episodes, and 1 experienced 5 episodes, producing an overall recurrence of 27%. Among the 18 participants who exhibited subthreshold BED, 12 experienced 1 episode, 3 experienced 2 episodes, 2 experienced 3 episodes, and 1 experienced 4 episodes, producing an overall recurrence of 33%. Sixteen of the 17 participants who exhibited PD episodes had 1 episode and 1 participant had 2 episodes, producing an overall recurrence of 6%.

### Diagnostic Progression and Diagnostic Crossover

Results for diagnostic progression and crossover are presented in Table 5. Of the 14 participants with atypical AN, none progressed to AN (0%). Of the 22 participants with subthreshold BN, 7 progressed to BN (32%). Of the 18 participants with subthreshold BED, 5 progressed to BED (28%). The most common diagnostic crossover occurred from subthreshold BN to BED (23%), from subthreshold BED to subthreshold BN (22%) and threshold BN (22%), and from BED to subthreshold BED (33%). The lowest diagnostic crossover occurred for AN (0%), followed by atypical AN (2%).

### Discussion

The first aim was to investigate the lifetime prevalence and incidence of DSM-5 eating disorders by age 20, as well as the peak risk periods for onset of these disorders. The lifetime prevalence was 0.8% for AN, 2.6% for BN, 3.0% for BED, 2.8% for atypical AN, 4.4% for subthreshold BN, 3.6% for subthreshold BED, and 3.4% for PD based on the newly proposed diagnostic criteria. The overall lifetime prevalence of any eating disorder by age 20 was 13.1%. More individuals received a FED-NEC diagnosis (11.5%) versus one of the threshold eating disorders (5.2%). The prevalence of the proposed DSM-5 eating disorders was slightly higher than the prevalence for parallel diagnoses based on DSM-IV criteria (Favaro, Ferrara, & Santonastaso, 2003; Kjelsas et al., 2004; Lewinsohn et al., 2000; Patton et al., 2008; Stice et al., 2009; Wade et al., 2006). For instance, data from this same sample revealed prevalence estimates 0.6% and 0.6% for subthreshold and threshold AN, 6.1% and 1.6% for subthreshold and threshold BN, 4.6% and 1.0% and for subthreshold and threshold BED, and 4.4% for PD (Stice et al., 2009), which summed to a lifetime prevalence of any eating disorder of 12%. The increase in the prevalence of eating disorders for the DSM-5 diagnoses resulted primarily because the thresholds for AN, BN, and BED were reduced. Reducing the required frequency (for BN and BED) and duration of binge eating (for BED) increased the prevalence of BN by 1% and the prevalence of BED by 2%. Importantly, the fact that effect sizes for impairment were larger for DSM-5 relative to DSM-IV BN and BED cases (Stice et al., 2009), suggesting that these proposed revisions to DSM-5 do not result in the identification of eating disorder cases marked by less impairment. The near 5-fold increase in atypical AN versus the previous subthreshold AN was particularly striking, which was apparently driven by the fact that the new diagnoses focuses more on marked weight loss than on a low body weight. However, it is important to acknowledge that the decisions we had to make in order to operationalize the FEDNEC eating disorders undoubtedly influenced the overall prevalence and that if alternative operational decisions had been used, results would have differed.

The prevalence estimates from the present study are novel because this is the first study to report data for DSM-5 eating disorders from a community-recruited sample that completed annual diagnostic interviews during the entire adolescent period. A primary reason for refining the diagnostic criteria for eating disorders in DSM-5 was to reduce the number of

individuals who would receive an EDNOS diagnosis, which has limited prognostic utility because it is so heterogeneous. Although most of individuals who received a lifetime eating disorder diagnoses fell under the broad umbrella of the FED-NEC category, replicating results observed by Keel and associates (2011), these individuals were assigned to qualitatively distinct more homogeneous diagnostic categories. It will be necessary for additional research to examine the course, prognosis, and optimal treatments for the various FED-NEC conditions in order to increase the clinical utility of these diagnostic categories.

The annual incidence data suggest that the peak ages for onset was between 19 and 20 for atypical/threshold AN, between 16 and 20 for subthreshold/threshold BN, and between 18 and 20 for subthreshold/threshold BED, PD, and the broader FED-NEC category. This appears to be the first study to report on the peak period of risk for onset of the new DSM-5 eating disorders using prospective data. However, it is possible that the peak period of risk for some of these disorders, such as BN and PD, occurs in young adulthood because the non-cumulative hazard curves do not clearly taper off during the late adolescent period examined herein. The evidence that most eating pathology tends to emerge in late adolescence suggests that developmental experiences that typically occur in this age period, such as heightened importance placed on conforming to the thin-ideal precipitated by more time spent with peers and dating partners, may increase risk for eating pathology. It is also possible that the decline in physical activity that occurs in adolescents for females, but not males (Jerstad, Boutelle, Ness, & Stice, 2010; Pratt, Macera, & Blanton, 1999), causes a positive energy balance that leads some young women to resort to the unhealthy weight control behaviors that characterize eating disorders (e.g., fasting, diuretic use, vomiting).

The second aim was to investigate whether youth with DSM-5 eating disorders show functional impairment, emotional distress, suicidality, mental health treatment, and an unhealthy BMI relative to eating disorder-free youth, with effect sizes that were typically medium to large in magnitude. Those with DSM-5 AN reported significantly greater functional impairment and mental health treatment, and significantly lower BMI, than participants without eating disorders; the effect size for emotional distress was medium in magnitude, but did not reach significance. It was noteworthy that participants with DSM-5 AN reported slightly lower suicidality than participants without eating disorders, suggesting that the higher suicidality for DSM-IV AN found in clinical samples (Franko & Keel, 2006) may not consistently emerge in community samples. Participants with DSM-5 BN, BED, and subthreshold BN reported significantly greater functional impairment, emotional distress, suicidality, and elevated treatment seeking than participants without an eating disorder, but there were no differences in BMI. Participants with any FED-NEC condition showed greater impairment on all indices examined herein relative to participants without an eating disorder. Participants with atypical AN reported significantly greater functional impairment, emotional distress, and suicidality than participants without eating disorders. Participants with subthreshold BED reported significantly greater emotional distress and suicidality relative to participants without eating disorders; there were also medium effect sizes for functional impairment and mental health treatment that did not reach significance. Participants with PD reported significantly greater emotional distress, suicidality, and BMI than participants without eating disorders. The average effect size across impairment indices (all coded positively) was 1.0 for AN, .77 for BN, .86 for BED, .71 for subthreshold BN, but only .51 for atypical AN<sup>2</sup>, .53 for subthreshold BED<sup>3</sup>, and .48 for PD<sup>4</sup>. This pattern suggests that there may be merit in increasing the frequency of certain abnormal eating

<sup>2</sup>We constructed an alternative version of atypical AN in which we added the requirement that the participant was below the median weight for her age. For the 8 participants that met criteria for this alternative version of atypical AN versus non-eating disordered participants, there was a large effect for functional impairment ( $d = 1.01$ ) and suicidality ( $d = 1.33$ ), medium effects for emotional distress ( $d = 0.79$ ), mental health treatment ( $d = 0.61$ ), and BMI scores ( $d = -0.60$ ), resulting in an average effect size of  $d = .87$ .

behaviors or adding attitudinal symptoms for the DSM-5 diagnostic categories with relatively less impairment, at least based on how we operationalized the DSM-5 FED-NEC categories and on the impairment indices examined herein. Future research should explore refinements to the diagnostic criteria for these conditions that better capture individuals with elevated impairment.

The third aim was to examine the episode duration, remission, recurrence, diagnostic progression, and diagnostic crossover for DSM-5 eating disorders. Average episode duration in months was 8.0 for AN, 2.9 for BN, 3.3 for BED, 11.6 for atypical AN, 3.5 for subthreshold BN, 3.0 for subthreshold BED, 5.0 for PD, and 5.9 for the overall FED-NEC category. The fact that atypical AN and PD showed some of the longer episode durations suggests that the current operationalizations of these conditions captures clinically meaningful eating pathology. These average episode duration values were similar to those observed for subthreshold/threshold DSM-IV eating disorders in this same sample (Stice et al., 2009) and for other prospective studies that have used community recruited samples (e.g., Lewinsohn et al., 2000). These durations are considerably shorter than average duration estimates based on retrospective reports from treatment-seeking samples and from community samples for DSM-IV eating disorder diagnoses. Retrospective reports from community samples indicate that the mean duration of illness is between 1.7 to 5.7 years for AN, 5.8 to 8.3 years for BN, and 8.1 to 14.4 years for BED (Hudson et al., 2007; Pope et al., 2006; Rastam et al., 2003). Retrospective reports from patient samples indicate that the mean duration of illness is between 9.3 and 14.7 years for AN, 7.7 and 11.7 years for BN, and 14.4 years for EDNOS (Herzog et al., 1999; Milos et al., 2005). The studies involving patient versus community samples probably found longer illness duration because episode duration, as well as illness severity and functional impairment, predict treatment seeking (Keel et al., 2002). However, another interpretation of this pattern of findings is that eating disorders wax and wane over time and that the retrospective reports from cross-sectional studies do not detect this variation in symptom presentation. This alternative explanation accords with evidence of frequent remission and relapse in other prospective studies that have involved repeated diagnostic interviews (Bohon, Stice, & Burton, 2009; Fairburn et al., 2000). This interpretation suggests that future descriptive pathology studies in the field of eating disorders should not rely on retrospective reports regarding the course of eating disorders.

Remission rates were high in this community sample; 1-year remission rates were 75% for AN, 100% for BN, 93% for BED, 71% for atypical AN, 100% for subthreshold BN and BED, 94% for purging disorder, and 89% for the overall FED-NEC category. These rates are similar to the 1-year remission rates observed for DSM-IV subthreshold/threshold eating disorder diagnoses (Stice et al., 2009). It is noteworthy that the present remission rates are much higher than reported in prospective studies of treatment-seeking samples (e.g., Fichter & Quadflieg, 2007; Herzog et al., 1999), probably due to the fact that individuals who seek treatment show more extreme eating pathology. However, it is also possible that relying on retrospective reports over longer reporting windows produces a different picture than prospective studies involving more frequent assessments with shorter reporting windows.

<sup>3</sup>We constructed an alternative version of subthreshold BED in which we added the requirement that the weight and shape were one of the main aspects of self-evaluation for the participant. For the 14 participants that met criteria for this alternative version of subthreshold BED versus non-eating disordered participants, there was a large effect for emotional distress ( $d = 1.08$ ), and BMI scores ( $d = 1.02$ ), a medium effect size for suicidality ( $d = 0.72$ ) and mental health treatment ( $d = 0.53$ ), and small effects for functional impairment ( $d = 0.45$ ), resulting in an average effect size of  $d = .76$ .

<sup>4</sup>We constructed an alternative version of PD in which we added the requirement that participants exhibited a definite fear of weight gain more than 75% of the days for at least 3 months. For the 13 participants that met criteria for this alternative version of subthreshold PD versus non-eating disordered participants, there was a large effect for suicidality ( $d = 1.05$ ), a medium effect size for emotional distress ( $d = 0.74$ ) and BMI scores ( $d = 0.60$ ), and a small effect size for and mental health treatment ( $d = 0.43$ ) and functional impairment ( $d = 0.48$ ), resulting in an average effect size of  $d = .66$ .

Another factor that might have contributed to the lower remission rates reported in previous studies is that some former studies used more conservative definitions. For instance, Herzog and associates (1999) required the absence of symptoms or the presence of only residual symptoms for a period of 8 consecutive weeks for full recovery (versus 4 weeks for the present report).

Recurrence rates in the present study were 25% for AN, 23% for BN, 33% for BED, 21% for atypical AN, 27% for subthreshold BN, 33% for subthreshold BED, 6% for PD, and 32% for the overall FED-NEC category. These findings are novel because research has not reported the recurrence rates for the new DSM-5 eating disorders, though they are generally similar to the recurrence rates for DSM-IV eating disorders from the present sample (Stice et al., 2009). The fact that on average recurrence rates were higher for BN and BED might imply that regular binge eating results in some fundamental change that increases risk for re-emergence of binge eating. It has been theorized that cues, such as the sight of advertisements for energy dense foods that become associated with binge eating through conditioning trigger food cravings when these cues are encountered, contributing to relapse (Jansen, 1998). In juxtaposition, the recurrence rate for PD was considerably lower than for the other DSM-5 eating disorder diagnoses, suggesting that maintenance processes for purging behaviors may be less potent.

With regard to diagnostic progression, 0% of individuals progressed from atypical AN to AN, whereas 32% progressed from subthreshold BN to BN and 28% progressed from subthreshold BED to BED. These diagnostic progression rates are somewhat higher than has been observed in community samples previously for DSM-IV eating disorders (Lewinsohn et al., 2000; Patton et al., 1990; Stice et al., 2009). The fact that diagnostic progression was markedly higher for eating disorders characterized by binge eating seems to imply that engaging in regular binge eating may somehow increase the risk for future escalation of this behavior. There is evidence that regular intake of energy dense foods - the types of food that people typically eat during binge episodes - may lead to an attenuation of reward region response to intake of that food, which might prompt escalating levels of intake to achieve the same degree of satisfaction as previously experienced (Alsio et al., 2010; Burger & Stice, 2012). However, it is also possible that the marked difference between atypical AN and AN with regard to the BMI criteria results in qualitatively different individuals developing these two types of eating disorders. This analysis suggests that it might be useful for future research to test whether there is value in requiring a low BMI for atypical AN.

There was also evidence of diagnostic crossover from one disorder to another. The most common diagnostic crossover occurred from subthreshold BN to BED (23% of initial subthreshold BN cases), from subthreshold BED to subthreshold BN (22% of initial subthreshold BED cases), from subthreshold BED to BN (22% of initial subthreshold BED cases), and from BED to subthreshold BED (33% of initial BED cases). Diagnostic crossover was much lower for the remaining possible combinations of diagnostic categories, suggesting that diagnostic crossover is most likely between eating disorders involving binge eating. In general, these crossover rates are similar to those observed in previous studies of DSM-IV eating disorders that used community (Keel et al., 2005; Rastam et al., 2003; Stice et al., 2009; Striegel-Moore et al., 2001) or patient samples (Fichter & Quadflieg, 2007; Milos et al., 2005). This moderate diagnostic crossover suggests some fluidity in diagnoses, which occurs in other broad classes of psychiatric diagnoses, such as mood and anxiety disorders (Krueger, Caspi, Moffitt, & Silva, 1998). These data on diagnostic progression and crossover might be construed as providing evidence for the predictive validity of the new DSM-5 eating disorder diagnoses.

## Limitations

It is important to consider the study limitations when interpreting the findings. First, results should be interpreted with caution, particularly the analyses involving impairment, because the prevalence and incidence of certain eating disorders were relatively low (e.g., AN). Second, we used single interview questions to assess emotional distress and suicidal ideation and a single survey question to assess mental health service utilization, which limited our ability to assess all aspects of these validation variables. Third, retrospective data suggest that the average age of onset for certain eating disorders, including BED and PD, occur in the early twenties (Hudson et al., 2007; Wade et al., 2006; Stiegel-Moore et al., 2001), implying that the estimates regarding peak periods of risk, prevalence, remission, recurrence, diagnostic progression, and diagnostic crossover may be biased. However, Patton and associates (2008) found that few new cases of threshold or partial AN or BN emerged during young adulthood in a prospective study. Fourth, we were unable to diagnose night eating syndrome or assess the persistent behavior to avoid weight gain symptom of AN, as those are new symptom criteria proposed for DSM-5 and were not assessed in this study. We also did not assess pica or rumination disorder, which may be listed under the broad category of eating disorders in DSM-5. Fifth, the moderate enrollment rate (56%) might have influenced the results reported herein, though it should be noted that we described this project as a study of mental and physical health during adolescents and did not mention eating disorders in the recruitment material.

## Clinical and Research Implications

Findings suggest that eating pathology affects one in eight young women. Although these conditions were not associated with the protracted course and high relapse rates suggested by previous patient samples, these eating disorders were marked by functional impairment, emotional distress, treatment seeking, diagnostic progression and crossover, and moderate relapse. Collectively, these data provide evidence for the validity of the proposed DSM-5 eating disorder diagnoses, including the fact that atypical/subthreshold AN, BN, and BED are associated with a similar degree of impairment as are threshold AN, BN, and BED. The fact that many participants who would have been classified as EDNOS can now receive a more descriptive diagnosis with prognostic significance is a key advantage of the new nosology system. The present results suggest that some refinements to the DSM-5 eating disorder criteria should be examined in future research. We believe that with only minor refinements, the new DSM-5 eating disorder diagnostic system will promote improved research of eating disorders and foster advances in prevention and treatment interventions for these pernicious psychiatric conditions. The fact that 13% of adolescent females experience an eating disorder during the second decade of life underscores the alarming prevalence of these conditions and the need for dissemination of effective prevention programs and for screenings to identify those who could benefit from effective indicated prevention or treatment interventions.

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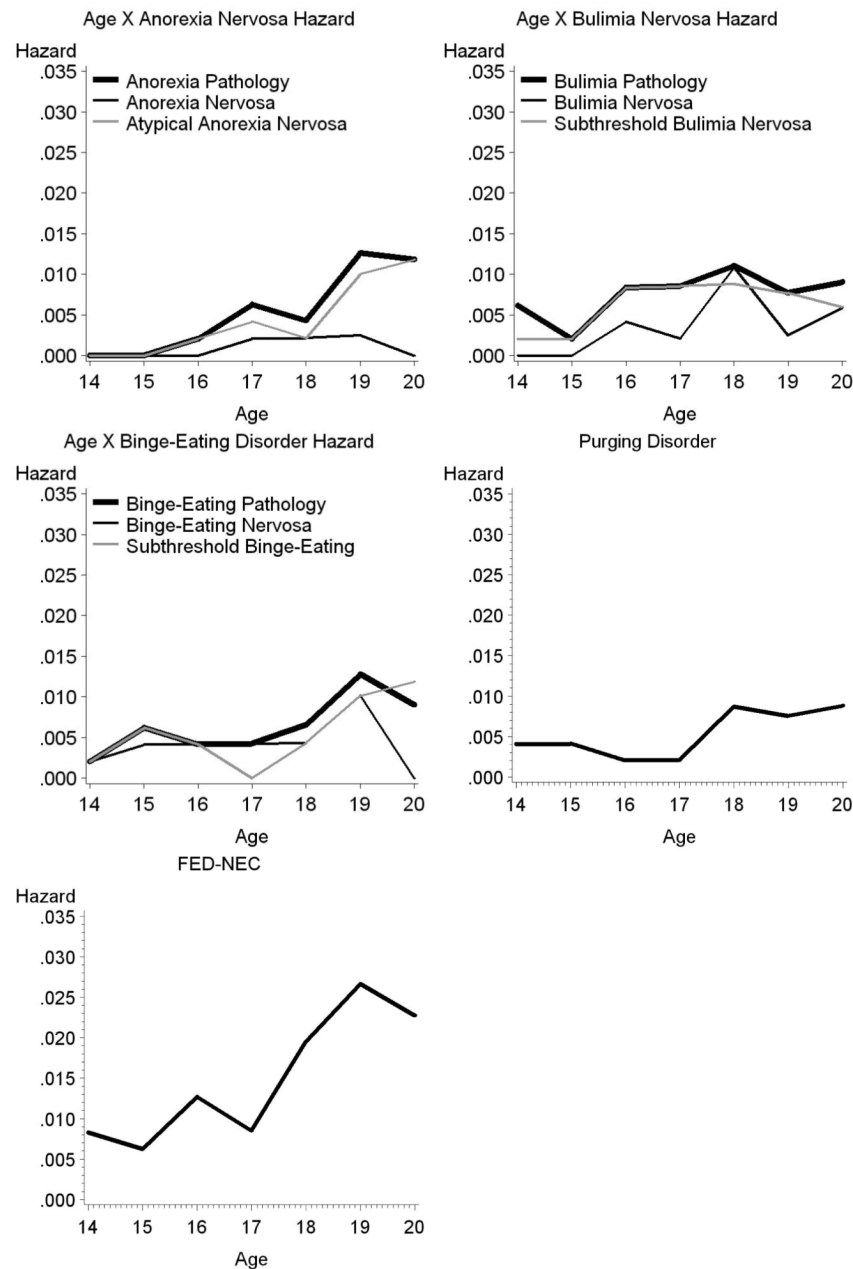
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**Figure 1.**

Non-cumulative hazard functions of DSM-5 eating disorders and FED-NEC conditions by age.

Note: The Y axis depicts the non-cumulative hazard rate for each disorder, which reflects the annual risk for onset of the condition (annual incidence). Anorexic pathology reflects a combination of AN and atypical AN, bulimic pathology reflects BN and subthreshold BN, and binge eating pathology reflects BED and subthreshold BED. See Table 3 for the number of participants who showed incidence of eating disorder during the 8-year follow-up, which is what was graphed above.

**Table 1****Diagnostic criteria for DSM-5 eating disorders**

Eating Disorder	
Anorexia nervosa	<ul style="list-style-type: none"> <li>● BMI less than 85% of the median expected for age and gender</li> <li>● Definite fear of weight gain more than 75% of the days for at least 3 months</li> <li>● Weight and shape were one of the main aspects of self-evaluation</li> </ul>
Bulimia nervosa	<ul style="list-style-type: none"> <li>● At least 4 uncontrollable binge-eating episodes per month for at least 3 months</li> <li>● At least 4 compensatory behavior episodes per month for at least 3 months</li> <li>● Weight and shape was definitely one of the main aspects of self-evaluation</li> </ul>
Binge eating disorder	<ul style="list-style-type: none"> <li>● At least 4 uncontrollable binge-eating episodes/days per month for at least 3 months</li> <li>● Less than 1 compensatory behavior on average per month during this period</li> <li>● Marked distress about binge eating</li> <li>● Binge eating characterized by 3 or more of the following: rapid eating; eating until uncomfortably full; eating large amounts when not physically hungry; eating alone because of embarrassment; feeling disgusted, depressed, or guilty after overeating</li> </ul>
Feeding or Eating Disorder-Not Elsewhere Classified	
Atypical anorexia nervosa	<ul style="list-style-type: none"> <li>● At least a 10% reduction in weight</li> <li>● Definite fear of weight gain more than 75% of the days for at least 3 months</li> <li>● Weight and shape were one of the main aspects of self-evaluation</li> </ul>
Subthreshold bulimia nervosa	<ul style="list-style-type: none"> <li>● At least 2 uncontrollable binge-eating episodes per month for at least 3 months or at least 6 episodes over a shorter period</li> <li>● At least 2 compensatory behavior episodes (i.e., self-induced vomiting, laxatives or diuretic use, fasting, and excessive exercise to compensate for overeating) per month for at least 3 months or at least 6 episodes over a shorter period</li> <li>● Weight and shape was definitely one of the main aspects of self-evaluation</li> </ul>
Subthreshold binge eating disorder	<ul style="list-style-type: none"> <li>● At least 2 uncontrollable binge-eating episodes/days per month for at least 3 months or at least 6 episodes over a shorter period</li> <li>● Less than 1 compensatory behavior on average per month during this period</li> <li>● Marked distress about binge eating</li> <li>● Binge eating characterized by three or more of the following: rapid eating; eating until uncomfortably full; eating large amounts when not physically hungry; eating alone because of embarrassment; feeling disgusted, depressed, or guilty after overeating</li> </ul>
Purging disorder	<ul style="list-style-type: none"> <li>● At least 4 episodes of self-induced vomiting or diuretic/laxative use for weight control purposes per month for at least 3 months</li> <li>● Less than 1 uncontrollable binge-eating episode on average per month during this period</li> <li>● Weight and shape were one of the main aspects of self-evaluation</li> </ul>

Note: Anorexia nervosa took diagnostic precedence over bulimia nervosa and binge eating disorder.

**Table 2**

Percentage of participants that were missing survey or interviews at each of the time points

Year	Missing survey data	Missing interview data
1	0%	0%
2	4%	3%
3	3%	3%
4	2%	2%
5	3%	3%
6	5%	4%
7	9%	8%
8	10%	8%

Incidence and prevalence rates for DSM-5 eating disorders in a sample of 496 adolescent females followed over an 8-year period

Table 3

Eating Disorder	Lifetime prevalence by Age 20 n (%), CI)	Cumulative incidence over 8-year follow-up n (%), CI)	Incidence per 100,000 person years	Annual prevalence							
				Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8
Anorexia nervosa	4 (0.8 ± 0.6)	4 (0.8 ± 0.6)	104	0	0	0	.0	1	1	2	3
Bulimia nervosa	13 (2.6 ± 1.4)	11 (2.2 ± 1.1)	289	2	1	1	1	2	5	4	3
Binge eating disorder	15 (3.0 ± 1.3)	13 (2.7 ± 1.2)	343	2	2	1	1	3	3	7	3
Feeding or Eating Disorder-Not Elsewhere Classified	57 (11.5 ± 2.8)	53 (10.8 ± 2.8)	1434	4	7	6	6	9	13	20	18
Atypical anorexia nervosa	14 (2.8 ± 1.5)	14 (2.8 ± 1.5)	366	0	0	0	1	4	3	6	9
Subthreshold bulimia nervosa	22 (4.4 ± 1.6)	19 (3.9 ± 1.7)	504	3	1	3	3	4	7	7	2
Subthreshold binge eating disorder	18 (3.6 ± 1.5)	17 (3.5 ± 1.4)	447	1	3	1	1	1	3	6	7
Purging disorder	17 (3.4 ± 1.6)	17 (3.5 ± 1.4)	447	0	4	2	1	3	2	5	4

Note: Eating disorder classifications are not mutually exclusive across disorders or between subthreshold and threshold cases (e.g., a participant could have been classified as being subthreshold bulimia nervosa at one time, then threshold at another time). Lifetime prevalence reflects the number of participants who met criteria at baseline and those who showed onset of these eating disorders during the 8-year follow-up. Cumulative 8-year incidence reflects the number of participants who showed onset during the 8-year follow-up, excluding those who met criteria at baseline. Annual prevalence reflects the number of participants who met criteria for a disorder at any point during each annual assessment period.

**Table 4**

Means, (standard deviations) and effect sizes for the impairment variables for DSM-5 eating disorder groups and non-eating disordered participants

Eating Disorder	Functional Impairment M (SD) <i>d</i>	Emotional Distress M (SD) <i>d</i>	Suicidality M (SD) <i>d</i>	Mental Health Treatment M (SD) <i>d</i>	BMI M (SD) <i>d</i>
Anorexia nervosa	2.59 (0.70) 1.15 *	1.79 (0.71) 0.62	1.00 (0.00) -0.21	7.56 (7.07) 1.96 ***	16.76 (0.79) -1.38 **
Bulimia nervosa	2.34 (0.51) 0.76 ***	2.23 (0.90) 1.06 ***	1.58 (0.95) 1.17 ***	4.71 (6.15) 1.27 ***	22.79 (2.63) 0.08
Binge eating disorder	2.62 (0.80) 1.06 ***	2.27 (1.08) 1.22 ***	1.67 (1.05) 1.14 ***	4.43 (5.76) 1.10 ***	23.51 (4.68) 0.27
FED-NEC	2.29 (0.57) 0.59 ***	1.99 (0.99) 0.77 ***	1.45 (0.81) 0.76 ***	2.03 (4.05) 0.37 **	24.70 (5.85) 0.46 **
Atypical anorexia nervosa	2.51 (0.76) 0.98 ***	1.89 (1.21) 0.55 *	1.46 (1.01) 0.73 **	2.29 (4.46) 0.36	21.88 (2.08) -0.24
Subthreshold bulimia nervosa	2.48 (0.75) 0.86 ***	2.13 (1.05) 1.07 ***	1.64 (0.95) 1.22 ***	2.82 (4.89) 0.65 ***	23.53 (3.32) 0.26
Subthreshold binge eating disorder	2.16 (0.46) 0.43	2.08 (0.97) 0.94 ***	1.33 (0.77) 0.51 *	2.07 (4.29) 0.41	26.38 (8.43) 0.81 **
Purging disorder	2.23 (0.48) 0.38	1.85 (1.00) 0.49 *	1.62 (0.93) 1.10 ***	1.87 (3.80) 0.25	25.44 (5.02) 0.64 **
Eating disorder-free	2.09 (0.32)	1.41 (0.44)	1.13 (0.31)	1.09 (1.96)	22.13 (4.29)

Note: Mental health treatment reflects the frequency of visits to any type of mental health care provider. Functional impairment was rates on a 5-point scale ranging from 1 = never to 5 = always, with higher scores reflecting more impairment. Emotional distress was rating on a 4-point scale ranging from 1 = not at all to 4 = severe.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*  $p < .001$

Transitions between eating disorder diagnoses with percentage of initial disorder that transitioned to a subsequent disorder in parentheses

Disorder/Condition	Subsequent Diagnosis/Condition							
	Anorexia nervosa	Bulimia nervosa	Binge eating disorder	FED-NEC	Atypical anorexia nervosa	Subthreshold bulimia nervosa	Subthreshold binge eating disorder	Purging disorder
Anorexia nervosa	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Bulimia nervosa	0 (0%)	0 (0%)	3 (23%)	1 (8%)	1 (8%)	2 (15%)	1 (8%)	0 (0%)
Binge eating disorder	0 (0%)	3 (20%)	0 (0%)	5 (33%)	3 (20%)	2 (13%)	5 (33%)	0 (0%)
FED-NEC	0 (0%)	9 (16%)	9 (16%)	0 (0%)	4 (7%)	5 (9%)	2 (4%)	3 (5%)
Atypical anorexia nervosa	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (14%)
Subthreshold bulimia nervosa	0 (0%)	7 (32%)	5 (23%)	0 (0%)	3 (14%)	0 (0%)	2 (9%)	0 (0%)
Subthreshold binge eating disorder	0 (0%)	4 (22%)	5 (28%)	0 (0%)	1 (6%)	4 (22%)	0 (0%)	1 (6%)
Purging disorder	0 (0%)	1 (6%)	1 (6%)	0 (0%)	2 (12%)	1 (6%)	0 (0%)	0 (0%)