



MACQUARIE
University
SYDNEY · AUSTRALIA

Macquarie University PURE Research Management System

This is the accepted author manuscript version of an article published as:

Mitchison, D., Mond, J., Bussey, K., Griffiths, S., Trompeter, N., Lonergan, A., Pike, K. M., Murray, S. B. and Hay, P. (2020). DSM-5 full syndrome, other specified, and unspecified eating disorders in Australian adolescents: Prevalence and clinical significance. *Psychological Medicine*, 50(6), 981-990.

Access to the published version: <https://doi.org/10.1017/S0033291719000898>

Copyright Cambridge University Press 2019. Published by Cambridge University Press. This article has subsequently been published in a revised form in *Psychological Medicine*, Vol. 50 Iss. 6, pp. 981-990. The original article can be found at <https://doi.org/10.1017/S0033291719000898>. This version is free to view and download for private research and study only. Not for re-distribution or re-use.

TITLE: DSM-5 Full Syndrome, Other Specified, and Unspecified Eating Disorders in 5000
Adolescents: Prevalence and Clinical Significance

AUTHORS:

Deborah Mitchison	Translational Health Research Institute, School of Medicine, Western Sydney University, Sydney, Australia; Department of Psychology, Macquarie University, Sydney, Australia
Jonathan Mond	Centre for Rural Health, University of Tasmania, Launceston, Australia; School of Medicine, Western Sydney University, Sydney, Australia
Kay Bussey	Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia
Scott Griffiths	School for Psychological Sciences, University of Melbourne, Sydney, Australia
Nora Trompeter	Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia
Alexandra Lonergan	Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia
Kathleen M. Pike	Departments of Psychiatry and Epidemiology, Columbia University, New York, United States of America
Stuart B. Murray	Department of Psychiatry, University of California San Francisco, San Francisco, CA, United States of America
Phillipa Hay	Translational Health Research Institute, School of Medicine, Western Sydney University, Sydney, Australia

Corresponding Author

Deborah Mitchison
Translational Health Research Institute, Western Sydney University
Blacktown 2109 NSW Australia
+61409322444
debbie.mitchison@gmail.com

ACKNOWLEDGMENTS:

The authors wish to thank the participants, and their families and schools for contributing their time to the EveryBODY Study.

FINANCIAL SUPPORT:

This work was supported by a Macquarie University Research Fellowship (DM) and a Society for Mental Health Research Early Career Researcher Project Grant (DM).

CONFLICTS OF INTEREST:

Dr Mitchison is supported by the National Medical and Health Research Council (GNT 1158276). Professor Hay receives/has received sessional fees and lecture fees from the Australian Medical Council, Therapeutic Guidelines publication, and New South Wales Institute of Psychiatry and royalties/honoraria from Hogrefe and Huber, McGraw Hill Education, and Blackwell Scientific Publications, Biomed Central and PlosMedicine and she has received research grants from the NHMRC and ARC. She is Chair of the National Eating Disorders Collaboration Steering Committee in Australia (2019-) and Member of the ICD-11 Working Group for Eating Disorders (2012-) and was Chair Clinical Practice Guidelines Project Working Group (Eating Disorders) of RANZCP (2012-2015). She has conducted education for psychiatrists and prepared a report under contract for Shire Pharmaceuticals in regards to Binge Eating Disorder (July 2017). All views in this paper are her own.

ETHICAL STANDARDS:

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

WORD COUNTS

Abstract: 246

Manuscript: 4,499

ABSTRACT

Background: Little information is available on the prevalence of DSM-5 eating disorders in adolescence, and eating disorders remain unique in the DSM for not systematically including a criterion for clinical significance. This study aimed to provide the first prevalence report of the full suite of DSM-5 eating disorders in adolescence, and to examine the impact of applying a criterion for clinical significance. *Methods:* 5,191 (participation rate: 70%) Australian adolescents completed a survey measuring one-month prevalence of eating disorder symptoms for all criterial, “other specified” and unspecified eating disorders, as well as health-related quality of life and psychological distress. *Results.* The point prevalence of any eating disorder was 22.2% (12.8% in boys, 32.9% in girls), and “other specified” disorders (11.2%) were more common than full criterial disorders (6.2%). Probable bulimia nervosa and binge eating disorder, but not anorexia nervosa, were more likely to be experienced by older adolescents. Most disorders were associated with an increased odds for being at a higher weight. The prevalence of eating disorders was reduced by 40% (to 13.6%) when a criterion for clinical significance was applied. *Conclusions.* Eating disorders, particularly “other specified” syndromes, are common in adolescence, and are experienced across age, weight, socioeconomic and migrant status. The merit of adding a criterion for clinical significance to the eating disorders, similar to other DSM-5 disorders, warrants consideration. At the least, screening tools should measure distress and impairment associated with eating disorder symptoms in order to capture adolescents in greatest need for intervention.

KEYWORDS:

Eating disorders; prevalence; OSFED; adolescence; diagnosis

Prevalence estimates do not exist for all eating disorders published in the fifth revision of the *Diagnostic and Statistical Manual for Mental Disorders* (DSM-5) (American Psychiatric Association, 2013). Adolescent research of this kind is particularly lacking, despite this being the age during which eating disorders typically emerge (Volpe et al., 2016). Among the changes made to the eating disorders chapter in the DSM-5 is the replacement of the problematically dominant (Le Grange et al., 2012) “not otherwise specified” (EDNOS) residual diagnosis with two residual categories, “other specified” (OSFED) and “unspecified” (UFED) feeding and eating disorders. Adult prevalence studies suggest that DSM-5 residual diagnoses remain up to 6 times more common than criterial eating disorders (Hay et al., 2017), however whether this is true in adolescents remains largely unknown.

The five OSFED syndromes include atypical (non-underweight) anorexia nervosa, subthreshold bulimia nervosa, subthreshold binge eating disorder, purging disorder, and night eating syndrome. Although the DSM-5 put forward these syndromes in order to stimulate further research into their clinical utility, very little research of this kind has been executed. This includes no population prevalence estimates for night eating syndrome, in adults or adolescents, and no analysis of the prevalence of all five syndromes within the one study, which is needed to facilitate diagnostic comparisons. Especially important will be the elucidation of the burden and distribution of these syndromes during adolescence, a time of intense fluctuation in disordered eating (Patton et al., 2008).

Most adolescent prevalence studies have used female samples (e.g., Glazer et al., 2019, Stice et al., 2013). However, evidence that males constitute a substantial minority of eating disorder cases (Murray et al., 2017), and are over-represented in residual eating disorder diagnoses (Le Grange et al., 2012), signals the need to ensure that future studies are representative across gender. Three mixed gender population studies were found that have estimated the point prevalence of individual DSM-5 OSFED syndromes in adolescents (Allen et al., 2013, Hammerle et al., 2016, Micali et al., 2015). In an Australian longitudinal study of > 1,300 adolescents, atypical anorexia was identified in 0.3% and 0.9% of boys and girls at age 14, and no boys or girls at age 17 (Allen et al., 2013). Purging disorder was relatively more stable, found in 0.4% and 2.7% of boys and girls at age 14, and 0.6% and 2.1% at age 17, respectively. In a German study of > 1,600 German early-adolescents, 3.6% and 1.9% of the participants were identified with atypical anorexia nervosa and purging disorder, respectively, however no participants were identified with subthreshold bulimia nervosa nor subthreshold binge eating disorder (Hammerle et al., 2016). A larger study, of > 6,000 14 year-olds and > 5,000 16 year-olds in the US found estimates of 0.4%, 1.3% and 0.03% for purging disorder, subthreshold bulimia nervosa and subthreshold binge eating disorder, respectively, among 14 year-olds, and 1.5%, 3.2% and 0.4%, respectively, among 16 year-olds (Micali et al., 2015). Together these reports demonstrate that OSFED is likely to be more prevalent than any and all of the DSM-5 criterial eating disorders in adolescence, with point prevalence estimates for anorexia nervosa ranging from 0.1-2.5%, for bulimia nervosa 0.3-1.6%, and for binge eating disorder 0.5-1.2% (Flament et al., 2015, Hammerle et al., 2016, Micali et al., 2015, Allen et al., 2013).

The restriction of the above studies to particular adolescent age cohorts (e.g., “early adolescents”, 16 year-olds) may have limited what could be learned regarding the pattern of criterial and residual eating disorder occurrence across the adolescent period. Further, while it is known that adults with eating disorders have a greater likelihood of obesity (Hay et al., 2017), we know little about the association between weight status and DSM-5 eating disorders during adolescence. Although the study by Micali et al (2015) found an increased risk for being overweight or obese after two years among 14 year-olds with bulimia nervosa and binge eating disorder, arguably obese status should be

separated from overweight status given the lack of a clear association with health impairment found to be associated with the latter in adolescents (Halfon et al., 2013).

There is continuing concern regarding the challenge of overdiagnosis (“diagnostic inflation”), suggested to be unhelpful or at worst harmful to individuals and the health system (Moynihan et al., 2018, Frances, 2013). Although Frances argues that the cause of this within psychiatry is the lack of a “bright line separating the worried well from the mildly mentally disordered” in the DSM-5, it could be countered that the clinical significance criterion is intended to act precisely as this theoretical line. This criterion, requiring symptoms to be associated with distress and/or impairment, has the express purpose to reduce the over-pathologizing of symptomatic yet relatively unimpaired individuals, especially in epidemiological studies (American Psychiatric Association, 2013). However, a minority of disorders do not include this criterion – and eating disorders are a notable exception. Neither anorexia nervosa nor bulimia nervosa includes the clinical significance criterion, whereas binge eating disorder requires marked distress but not functional impairment. A possible reason for this may relate to ego-syntonicity and favorable regard for eating disorder-related weight loss, particularly in anorexia nervosa, which may impede assessment of distress and impairment (Jenkins et al., 2011). On the other hand, the omission of a criterion for clinical significance has implications regarding epidemiological and health burden assessment (Beals et al., 2004), and may explain the criticism of the DSM-5 inclusion of binge eating disorder (Frances, 2013). This issue may be most problematic in adolescent populations, given the high level of fluctuation in the onset and spontaneous remission of disordered eating at this time (Patton et al., 2008). Thus, estimating the extent to which meeting symptomatic criteria for an eating disorder during adolescence is associated with significant distress and/or impairment will be useful to inform the extent of overdiagnosis in eating disorder epidemiology. Further, there is ambiguity as to the role of the clinical significance criterion in the other/unspecified eating disorders. While it appears in the definition of UFED and a general statement suggests its need for the OSFED disorders, only night eating syndrome explicitly references distress and impairment in its description of symptoms (American Psychiatric Association, 2013). Thus, research that evaluates the inclusion of the clinical significance criterion in OSFED will also contribute to the evidence-base aiding decisions about the future status of these syndromes in the DSM and their diagnostic criteria.

Aims

This study aimed to report up-to-date prevalence estimates for the full range of DSM-5 eating disorders in a large general population sample of Australian adolescent boys and girls aged 12-19, including first-time estimates for all five OSFED syndromes. Further, this study aimed to examine, for the first time, the impact of applying the criterion for clinical significance on these prevalence estimates.

METHOD

Sampling Procedure and Participants

Data were used from the baseline survey of the EveryBODY Study, a longitudinal investigation of eating disorders among Australian adolescents. Sampling procedures have been detailed elsewhere (Trompeter et al., 2018). In brief, 4 independent and 9 government schools, from a broad range of socioeconomic advantage, participated. All parents and students received information about the study over a period of 4 weeks using multiple methods of dissemination, and a passive parental consent procedure was used, whereby parents could opt out their child from the study. Students who provided assent were given the online survey to complete at school. Participants were offered

the chance to enter a prize draw to win one of 10 gift vouchers, and the schools received a general wellbeing report based on their students' data. The study was approved by the Macquarie University Human Research Ethics Committee and the New South Wales Department of Education.

Measures

Sociodemographic Questions

Participants were asked demographic questions including age, school grade, gender, sex, country of birth, and postcode (which was later converted to a socio-economic index for area (SEIFA) score).

Eating Disorder Diagnoses

Table 1 provides the operationalisation of the diagnostic criteria. Most symptoms were captured by items of the *Eating Disorder Examination Questionnaire (EDE-Q)*, which assesses the presence and severity of cognitive and behavioural eating disorder symptoms and features (Fairburn and Beglin, 2008). This questionnaire has previously been validated in Australian adolescents boys and girls and demonstrates sound reliability (Mond et al., 2014). Items used in this study included the behavioral frequency items (self-induced vomiting, laxative misuse, driven exercise, and binge eating), and the Likert-type items that comprise the combined weight and shape concern subscales. As the frequency of behaviors were only assessed over the past one month (not the three months duration required for bulimia nervosa and binge eating disorder), we use the term "probable" for these diagnoses. McDonald's omega for the combined weight and shape concern subscale in the present study was 0.96 and 0.94 for girls and boys, respectively.

[INSERT TABLE 1 ABOUT HERE.]

Participants self-reported current weight and height, which was converted to age and gender adjusted body mass index (BMI) percentiles for children and adolescents. A BMI percentile < 10 was used for the underweight criterion of anorexia nervosa, as this cut-off has most frequently been used in adolescent epidemiological studies of DSM-5 anorexia nervosa (Nagl et al., 2016, Rojo-Moreno et al., 2015, Allen et al., 2013, Hammerle et al., 2016). Three items from the *Night Eating Questionnaire (NEQ)* (Allison et al., 2008) were used to assess symptoms of night eating syndrome, including proportion of daily food intake consumed following supper, nocturnal eating (eating after going to bed), and awareness during nocturnal eating. The NEQ has been validated in adolescents and is superior to parent report (Gallant et al., 2012a).

Several additional questions were developed by the researchers to capture frequency of additional extreme weight control behaviors (fasting, strict dieting, detoxes, insulin misuse, other drug use for weight loss), distress associated with binge eating, and additional diagnostic binge eating disorder features (e.g, eating faster than usual, eating alone due to embarrassment). Participants were also asked about any recent weight loss in the past 4 weeks to assess atypical anorexia nervosa.

Clinical Significance

Scores from the *K10 Psychological Distress Scale (K10)* (Kessler et al., 2002) and the *Pediatric Quality of Life Scale (PedsQL) SF15* (Varni et al., 2001, Varni et al., 2003) were used to measure clinically significant distress and functional impairment, respectively. The K10 measures the frequency of anxiety and depressive symptoms during the past 4 weeks using 10 Likert-type items. Scores range from 10 to 50, with higher scores indicating higher levels of distress. The K-10 has demonstrated high internal consistency and validity in predicting clinically significant levels of distress in general

population samples (Kessler et al., 2002). McDonald's omegas for the K-10 in girls and boys in the present study were 0.94 and 0.93, respectively.

The 12 items from the physical functioning, emotional functioning, and social functioning subscales of the PedsQL SF15 (Varni et al., 2003, Varni et al., 2001) were included in the survey. Items ask participants to indicate on a Likert type scale how true a series of statements are of them in the past 4 weeks. Scores are reversed and transformed on a 0-100 scale, such that higher scores indicate higher functioning. Subscale scores are derived as the mean of the items for that scale. For the purposes of this study we combined the emotional and social functioning scales to create a psychosocial subscale. The PedsQL SF15 has evidence of good reliability and validity in previous studies of adolescents (Varni et al., 2003). McDonald's omegas in the current study sample for the physical functioning subscale was 0.86 and 0.87 for girls and boys respectively, and for the psychosocial functioning subscale was 0.90 and 0.91 for girls and boys respectively.

Since clinical significance as a diagnostic criterion has not been operationalised previously for eating disorders, we tested two definitions: 1.) Lenient definition: K-10 score > 15 (indicative of moderate to severe distress) and/or PedsQL (physical or psychosocial subscale score) ≤ 1 SD below the sample mean; 2.) Stringent definition: K-10 score ≥ 30 (severe distress) and/or PedsQL (physical or psychosocial subscale score) ≤ 1 SD below the sample mean. These K-10 cut-offs have been used previously in population-based studies (Varni et al., 2003, Andrews and Slade, 2001), and the PedsQL cut-off is more conservative than cut-offs used previously to identify children with special health care needs and chronic conditions (Huang et al., 2009).

Statistical Analysis

Data were weighted according to the 2016 Census gender distribution information for adolescents in New South Wales, Australia (Australian Bureau of Statistics, 2017). Prevalence estimates were calculated, and a series of χ^2 tests with Bonferroni-adjusted post-hoc Z-tests were conducted to compare the prevalence by gender. To assess the relationship between diagnosis and odds of falling within the underweight (BMI $< 5^{\text{th}}$ percentile), overweight (85^{th} percentile \leq BMI $< 95^{\text{th}}$ percentile) or obese (BMI $\geq 95^{\text{th}}$ percentile) weight categories (relative to healthy weight; 5^{th} percentile \leq BMI $< 85^{\text{th}}$ percentile), a series of binary multivariate logistic regressions were employed, adjusting for age, gender, socioeconomic status and migrant status. Additional binary multivariate logistic regressions were employed to examine the odds of meeting criteria for each eating disorder according to socioeconomic status, school year, and migrant status, adjusted for gender and BMI percentile. Finally, descriptive analyses were conducted to determine the prevalence of eating disorder diagnoses after applying criteria for clinical significance.

RESULTS

Participant Characteristics

On average, 70% of students at each school participated in the study, and data were collected from $N = 5,191$ students. Of these, $n = 119$ were excluded due to completion of $< 10\%$ of the survey ($n = 39$), non-serious responses to open-ended questions ($n = 79$), and withdrawn consent ($n = 1$), leaving a total sample of $N = 5072$ students between 11-19 years (mean age = 14 years and 11 months). Data in this study were from the participants who completed the relevant measures for each analysis. Little's MCAR Test demonstrated that data were not missing at random, $p < .001$. Participants with missing data had similar distributions to participants with complete data for gender identity ($p = 0.33$) and migrant status ($p = 0.09$), but on average were in a slightly higher grade at school ($M = 3.3$, $SD = 1.8$ vs $M = 3.0$, $SD = 1.5$; $t(5069) = 4.0$, $p < .001$), and had a slightly lower

socioeconomic status ($M = 977.1$, $SD = 39.6$ vs $M = 985.5$, $SD = 41.9$; $t(4955) = -4.4$, $p < .001$). Of the included participants, 49.2% identified as male, 48.4% identified as female, and 2.4% identified as “other” (75.2% of participants identifying as “other” gender reported biological sex as male). Lower school grades were over-represented, with 41.7% in grades 7-8, 39.7% in grades 9-10, and 18.6% were in grades 11-12. Most participants were born in Australia (88.2%).

Prevalence of Eating Disorders by Gender

The point prevalence of each eating disorder is presented in Table 2 by gender, and broken down by gender and age group in Figure 1. As can be seen, almost all eating disorders were more common in females or participants who identified their gender as other, with the exception of night eating syndrome.

[INSERT TABLE 2 ABOUT HERE.]

[INSERT FIGURES 1A AND 1B ABOUT HERE.]

Body Mass Index Correlates

As can be seen in Table 3, eating disorders on the whole were more likely to be experienced by adolescents who had a BMI percentile within the overweight or obese range. In particular, adolescents who met criteria for probable bulimia nervosa, probable binge eating disorder, atypical anorexia nervosa, subthreshold bulimia nervosa, or UFED had significantly greater odds of being categorized as obese compared to adolescents without these disorders.

[INSERT TABLE 3 ABOUT HERE.]

Demographic Correlates

Holding other demographic variables constant, participants in mid (grades 9-10) and late (grades 11-12) adolescence were equally likely as participants in early (grades 7-8) adolescence to meet criteria for anorexia nervosa, atypical anorexia nervosa, subthreshold bulimia nervosa, purging disorder and UFED. Participants in both mid (OR = 2.1; 95% CI = 1.5, 3.0) and late (OR = 1.6; 95% CI = 1.1, 2.5) adolescence were however significantly more likely to meet criteria for probable bulimia nervosa, and participants in late adolescence were also much more likely to meet criteria for probable binge eating disorder (OR = 3.7; 95% CI = 1.6, 8.4) and subthreshold binge eating disorder (OR = 7.6; 95% CI = 1.6, 36.9) than early adolescents. Finally, participants in mid adolescence but not late adolescence, were more likely than younger adolescents to meet criteria for night eating syndrome (OR = 2.0; 95% CI = 1.4, 2.8).

No effects of migrant or socioeconomic status were found on the likelihood of meeting criteria for any current eating disorders when controlling for age, gender and BMI percentile.

Criterion for Clinical Significance-Adjusted Prevalence Estimates

As seen in Table 2, the prevalence of eating disorders when a lenient criterion for clinical significance was applied was reduced by only 1.5% (to 20.7%). However applying the more stringent criterion reduced eating disorder prevalence by 8.6% (to 13.6%). Within diagnostic groups, adding this stringent criterion for clinical significance reduced prevalence by between 17.1% to 57.7%, with the greatest reductions observed in purging disorder and UFED. Prevalence estimates that remained most robust to the addition of a criterion for clinical significance were probable binge eating disorder, anorexia nervosa and atypical anorexia nervosa. Around 75% or more of the cases diagnosed with these disorders using DSM-5 diagnostic criteria met criteria for clinical significance.

DISCUSSION

We found eating disorders to be common, with just over 1 in 5 adolescents (22.2%) meeting criteria for any DSM-5 diagnosis. We also found that applying a lenient criterion for clinical significance that allowed for participants who met symptomatic criteria to experience moderate distress and/or functional impairment had negligible impact on prevalence. On the other hand, application of a more stringent criterion, which captured participants who experienced severe distress and/or functional impairment, reduced eating disorder prevalence by two fifths to 13.6%. Until now, no study has examined all OSFED and UFED disorders in one sample of adolescents. Our findings align with similar research with adults (Hay et al., 2017), demonstrating that these residual disorders (16.4%) are (around 2.5 times) more common than criterial eating disorders. The most common disorders were probable bulimia nervosa (4.6%), night eating syndrome (4.1%), UFED (3.8%) and purging disorder (3.2%). The least prevalent were subthreshold binge eating disorder (0.3%), anorexia nervosa (0.7%) and probable binge eating disorder (1.0%).

Our prevalence estimates were similar to previous adolescent studies (Allen et al., 2013, Hammerle et al., 2016, Micali et al., 2015), with a few exceptions. Our global prevalence of 22.2% is almost identical to the 21% reported by Hammerle and colleagues for early adolescents (Hammerle et al., 2016), and sits between the prevalence estimates of 19% and 37% reported by Micali and colleagues for 14 and 16 year-olds, respectively (Micali et al., 2015). Purging disorder was more common in our study; however, post-hoc analysis suggests this may be explained by our inclusion of detox as a purging behaviour. When this behaviour was removed, the prevalence of purging disorder reduced by almost two-thirds to 1.2%. Further, when detox was included, fewer than half of the purging disorder cases were identified as clinically significant using the stringent definition. More research is required to determine whether using cleanses and detoxes for weight loss should be classified as a purging behaviour, and how best to operationalize this. Bulimia nervosa variants were high in prevalence. Their relatively higher rate compared to binge eating disorder conforms to the known younger age of onset for bulimia nervosa (Kessler et al., 2013). Despite high prevalence rates of binge eating disorder in some population studies (Hudson et al., 2007), the low prevalence observed in our study is on par with research using the full DSM-5 criteria for this disorder (Hay et al., 2017, Udo and Grilo, 2018). In particular, the current study applied the criterion of binge eating-related distress, which has not always been included in previous studies, and found that doing so reduced the prevalence of probable binge eating disorder by two thirds (data not presented). Inclusion of the distress criterion thus may address concerns about the over-pathologizing of binge eating (Frances and Widiger, 2012), which while being a common behaviour, does not always confer distress (Mitchison et al., 2017). OSFED syndromes were much more common than UFED, supporting the clinical utility of “other specified” DSM-5 entities to reduce the rate of unspecified diagnosis. On the other hand, UFED was identified in almost 4% of adolescents, and in this study (unlike most previous studies) required evidence of distress and or impairment, which supports previous findings that UFED may be similarly impairing to full syndrome eating disorders (Wade and O’Shea, 2015). Finally, while most previous studies (e.g., Allen et al., 2013, Hammerle et al., 2016) have applied the 10th BMI percentile cut-off for anorexia nervosa used in the current study, others have applied different cut-offs. This inconsistency has implications for comparison of prevalence estimates across studies, especially the ratio of anorexia nervosa to bulimia nervosa/atypical anorexia nervosa. Although there is no definitive cut-off stipulated in the DSM-5, the clinical utility of a lower cut-off has recently been criticised (Andersen et al., 2018).

All eating disorders except night eating syndrome were more likely to be found among adolescents who identified their gender as female or other, in line with previous studies findings with these

gender groups (Allen et al., 2013, Diemer et al., 2015). Yet eating disorders were also detected among 12.8% of boys, which highlights the need to include males in epidemiological studies. Our findings that eating disorders were similarly prevalent across age might reflect a lowering in the average age of onset, since mid-late adolescence has typically been thought to be the peak age of onset (Volpe et al., 2016, Schmidt et al., 2016). A 13 year-old in our study was as likely to meet criteria for anorexia nervosa as an 18 year-old. Probable bulimia nervosa and binge eating disorder were exceptions, being more likely to be experienced in older adolescence. There was no effect of socioeconomic status or migrant status, confirming that eating disorders do not discriminate on the basis of wealth or origin (Mitchison et al., 2014, Mulders-Jones et al., 2017).

Similar to recent prevalence studies in adults (Hay et al., 2017), most adolescents with eating disorders had a greater than two-fold increased likelihood to fall within the obese weight range. As expected, this included eating disorders characterised predominantly by binge eating (e.g., probable bulimia nervosa and binge eating disorder), but perhaps unexpectedly also included eating disorders characterised by extreme weight control behaviors (e.g., atypical anorexia nervosa and purging disorder). This latter finding may reflect either the greater preponderance of eating disorder symptoms among those in the population at a higher weight (da Luz et al., 2017) or the role of unsupervised and maladaptive weight control practices in maintaining binge eating and/or high weight (Fairburn et al., 2003). Longitudinal data is required to pin down these mechanisms.

This study provides the first population-based distribution data for night eating syndrome; well overdue, considering this syndrome was first described by Stunkard in 1955 (Stunkard et al., 1955). We found night eating syndrome to be very common, and the most common eating disorder among boys. These findings were similar to a study of undergraduates (Runfola et al., 2014). Contrary to original conceptions (Stunkard et al., 1955), it was also one of the few disorders not associated with obesity, which may be explained by the small quantity of food typically consumed during night eating episodes (Nolan and Geliebter, 2012). Further, distress and impairment were included in the operationalization of this syndrome in this study. These preliminary findings suggest that, rather than being trivial, confined to women (Striegel-Moore et al., 2005) or people in larger bodies (Gallant et al., 2012b), night eating syndrome among adolescents may be both common and disabling and worthy of further investigation.

Eating disorders are one of the rare cases in the DSM-5 that do not systematically include the clinical significance criterion (American Psychiatric Association, 2013). While there is contention regarding the incorporation of disability into definitions of disorder (Spitzer, 1998), a core purpose of the clinical significance criterion is to reduce the potential for overdiagnosis in epidemiological studies (American Psychiatric Association, 2013, Frances, 2013). The current findings, tempered by the self-report nature of the design, suggests that the frequency of clinically significant eating disorders are less prevalent than current “raw” estimates would suggest. This further implies, that in the broader community, the mere meeting of symptomatic criteria for an eating disorder is not uniformly associated with distress and/or impairment. Exceptions to this include full criterial and atypical anorexia nervosa, which were robust to the addition of the clinical significance criteria. It may be argued that the egosyntonicity of some eating disorder symptoms masks distress and impairment (Jenkins et al., 2011), making the addition of a clinical significance criterion spurious. Yet our findings regarding anorexia nervosa, considered the most ego-syntonic of the eating disorders, suggests that distress and impairment are self-identifiable by individuals with this disorder. Nonetheless, a total prevalence of 13.6% for the full spectrum of “clinically significant” eating disorders is demonstrative of a very high level of population health burden, affecting 1 in 7 youth.

Implications

The high rates of “raw” eating disorder prevalence raises questions about overdiagnosis in epidemiological studies of eating disorders. In part, the utility of psychiatric diagnostic criteria are predicated on their ability to accurately identify psychiatric presentations which render clinically significant impairment or distress, and thus require intervention. Future research in collaboration with the DSM and ICD Task Forces should consider the merit of including clinical significance as an additional criterion to the eating disorder diagnoses. This may have more impact on epidemiological rather than clinical practice, as it is well-documented that higher levels of distress and impairment are predictive of treatment-seeking among people with eating disorders (e.g., Mond et al., 2009). Another course of action might be to sharpen screening procedures to focus on identifying individuals with eating disorder symptoms that are associated with significant distress and/or impairment, as this will service those in greatest need. Additionally, our findings relating to the greater preponderance of OSFED as opposed to criterial eating disorder presentations suggest that enhanced awareness of the subtleties of these presentations among primary care providers may be crucial.

It should also be noted that spontaneous recovery is not uncommon during adolescence (Patton et al., 2008), which is a time where self-regulation skills are still being developed - and in the context of increasing autonomy. Thus while uptake of weight control behaviors as well as difficulties in regulating overeating in our sample was high, it is also possible that for many adolescents these behaviors will manifest only transiently, self-correcting with time. This further underscores the need to parse out clinically significant presentations. A longitudinal study that examines whether distress/impairment during adolescence is a predictor of eating disorder trajectories, in terms of duration and severity, will be valuable and would further support the sharpening of screening procedures to capture “clinical significance”.

Limitations and Strengths

Several limitations should be noted. First, diagnoses were defined using self-report measures, which may have impacted prevalence estimates. Previous studies have shown that participants report a higher frequency of behaviors on the EDE-Q compared to interview (Fairburn and Beglin, 1994), which may reflect either over-reporting or greater honesty when completing questionnaires. In order to clarify the accuracy of the current estimates, replication (preferably with a two phase design - screening followed by interview) is necessary. Second, symptoms over the past one month were assessed to reduce the timeframe over which adolescents were expected to recall. This precluded the inclusion of duration criteria in the diagnostic assignment of bulimia nervosa and binge eating disorder, which require three months duration of behaviors. On the other hand, at least one study has demonstrated very little impact of a one-month vs three-month duration of binge eating on the prevalence of binge eating disorder (Trace et al., 2012). Third, distress and impairment were measured using generic rather than disease-specific instruments, and scores on these measures may have been influenced by comorbid psychiatric conditions not controlled for in this study. Thus while we were able to select out participants with an eating disorder who were not distressed/impaired, doubt remains over whether the distress/impairment in the remaining cases was due to the eating disorder or other comorbidity. Although the parcelling out of impairment according to various comorbidities may be fraught (Mitchison et al., 2013), it is recommended that future studies account for the presence of comorbid psychopathology. Fourth, this study does not include avoidant/restrictive food intake disorder, which is emerging as an associated feeding disorder of interest (Eddy et al., 2015), and which requires future epidemiological investigation. Strengths of this study were the large representative sample and high response rate for this population, as well as the measurement of a broad range of symptoms.

Conclusion

In the absence of a consistently applied clinical significance criterion, DSM-5 eating disorders are very common among adolescents, OSFED disorders particularly so. Most eating disorders are associated with being at a higher weight, which may be associated, in time, with physical health impairment. Including a criterion for clinical significance in the diagnostic formulation of eating disorders may reduce potential overpathologizing of eating disorders, and should be considered in future iterations of classification schemes as well as in screening programs that inform the allocation of treatment resources.

REFERENCES

- ALLEN, K. L., BYRNE, S. M., ODDY, W. H. & CROSBY, R. D. 2013. DSM-IV-TR and DSM-5 eating disorders in adolescents: Prevalence, stability, and psychosocial correlates in a population-based sample of male and female adolescents. *Journal of Abnormal Psychology*, 122, 720-732.
- ALLISON, K. C., LUNDGREN, J. D., O'REARDON, J. P., MARTINO, N. S., SARWER, D. B., WADDEN, T. A., CROSBY, R. D., ENGEL, S. G. & STUNKARD, A. J. 2008. The Night Eating Questionnaire (NEQ): Psychometric properties of a measure of severity of the Night Eating Syndrome. *Eating Behaviors*, 9, 62-72.
- AMERICAN PSYCHIATRIC ASSOCIATION 2013. *Diagnostic and Statistical Manual of Mental Disorders: DSM-5* Arlington, American Psychiatric Publishing Inc.
- ANDERSEN, S. B., LINDGREEN, P., ROKKEDAL, K. & CLAUSEN, L. 2018. Grasping the weight cut-off for anorexia nervosa in children and adolescents. *Int J Eat Disord*, 51, 1346-1351.
- ANDREWS, G. & SLADE, T. 2001. Interpreting scores on the Kessler Psychological Distress Scale (K10). *Australian and New Zealand Journal of Public Health*, 25, 494-7.
- AUSTRALIAN BUREAU OF STATISTICS 2017. Population by Age and Sex, Regions of Australia, 2016: Population Estimates by Age and Sex, Regions of New South Wales (ASGS 2016), 2006 and 2016
- BEALS, J., NOVINS, D. K., SPICER, P. & ET AL. 2004. Challenges in operationalizing the DSM-IV clinical significance criterion. *Archives of General Psychiatry*, 61, 1197-1207.
- DA LUZ, F., SAINSBURY, A., MANNAN, H., TOUYZ, S., MITCHISON, D. & HAY, P. 2017. Prevalence of obesity and comorbid eating disorder behaviors in South Australia from 1995 to 2015. *International Journal of Obesity*, in press.
- DIEMER, E. W., GRANT, J. D., MUNN-CHERNOFF, M. A., PATTERSON, D. A. & DUNCAN, A. E. 2015. Gender Identity, Sexual Orientation, and Eating-Related Pathology in a National Sample of College Students. *Journal of Adolescent Health*, 57, 144-149.
- EDDY, K. T., THOMAS, J. J., HASTINGS, E., EDKINS, K., LAMONT, E., NEVINS, C. M., PATTERSON, R. M., MURRAY, H. B., BRYANT-WAUGH, R. & BECKER, A. E. 2015. Prevalence of DSM-5 avoidant/restrictive food intake disorder in a pediatric gastroenterology healthcare network. *International Journal of Eating Disorders*, 48, 464-470.
- FAIRBURN, C. G. & BEGLIN, S. J. 1994. Assessment of eating disorders: Interview or self-report questionnaire? *International Journal of Eating Disorders*, 16, 363-370.
- FAIRBURN, C. G. & BEGLIN, S. J. 2008. Eating disorder examination questionnaire (EDE-Q 6.0). In: FAIRBURN, C. G. (ed.) *Cognitive Behavior Therapy and Eating Disorders*. New York: Guilford Press.
- FAIRBURN, C. G., COOPER, Z. & SHAFRAN, R. 2003. Cognitive behaviour therapy for eating disorders: A "transdiagnostic" theory and treatment. *Behaviour Research and Therapy*, 41, 509-528.
- FLAMENT, M. F., BUCHHOLZ, A., HENDERSON, K., OBEID, N., MARAS, D., SCHUBERT, N., PATERNITI, S. & GOLDFIELD, G. 2015. Comparative distribution and validity of DSM-IV and DSM-5 diagnoses of eating disorders in adolescents from the community. *European Eating Disorders Review*, 23, 100-10.
- FRANCES, A. 2013. The past, present and future of psychiatric diagnosis. *World Psychiatry*, 12, 111-112.
- FRANCES, A., J. & WIDIGER, T. 2012. Psychiatric Diagnosis: Lessons from the DSM-IV Past and Cautions for the DSM-5 Future. *Annual Review of Clinical Psychology*, 8, 109-130.
- GALLANT, A. R., LUNDGREN, J., ALLISON, K., STUNKARD, A. J., LAMBERT, M., O'LOUGHLIN, J., LEMIEUX, S., TREMBLAY, A. & DRAPEAU, V. 2012a. Validity of the night eating questionnaire in children. *International Journal of Eating Disorders*, 45, 861-865.
- GALLANT, A. R., LUNDGREN, J. & DRAPEAU, V. 2012b. The night-eating syndrome and obesity. *Obesity Reviews*, 13, 528-536.

- GLAZER, K. B., SONNEVILLE, K. R., MICALI, N., SWANSON, S. A., CROSBY, R., HORTON, N. J., EDDY, K. T. & FIELD, A. E. 2019. The Course of Eating Disorders Involving Bingeing and Purging Among Adolescent Girls: Prevalence, Stability, and Transitions. *Journal of Adolescent Health*, 64, 165-171.
- HALFON, N., LARSON, K. & SLUSSER, W. 2013. Associations Between Obesity and Comorbid Mental Health, Developmental, and Physical Health Conditions in a Nationally Representative Sample of US Children Aged 10 to 17. *Academic Pediatrics*, 13, 6-13.
- HAMMERLE, F., HUSS, M., ERNST, V. & BÜRGER, A. 2016. Thinking dimensional: prevalence of DSM-5 early adolescent full syndrome, partial and subthreshold eating disorders in a cross-sectional survey in German schools. *BMJ Open*, 6.
- HAY, P., MITCHISON, D., COLLADO, A. E. L., GONZÁLEZ-CHICA, D. A., STOCKS, N. & TOUYZ, S. 2017. Burden and health-related quality of life of eating disorders, including Avoidant/Restrictive Food Intake Disorder (ARFID), in the Australian population. *Journal of Eating Disorders*, 5, 21.
- HUANG, I.-C., THOMPSON, L. A., CHI, Y.-Y., KNAPP, C. A., REVICKI, D. A., SEID, M. & SHENKMAN, E. A. 2009. The linkage between pediatric quality of life and health conditions: Establishing clinically meaningful cutoff scores for the PedsQL. *Value in Health*, 12, 773-781.
- HUDSON, J. I., HIRIPI, E., POPE JR, H. G. & KESSLER, R. C. 2007. The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological Psychiatry*, 61, 348-358.
- JENKINS, P. E., HOSTE, R. R., MEYER, C. & BLISSETT, J. M. 2011. Eating disorders and quality of life: A review of the literature. *Clinical Psychology Review*, 31, 113-121.
- KEEL, P. K. & STRIEGEL-MOORE, R. H. 2009. The validity and clinical utility of purging disorder. *International Journal of Eating Disorders*, 42, 706-719.
- KESSLER, R. C., ANDREWS, G., COLPE, L. J., HIRIPI, E., MROCZEK, D. K., NORMAND, S.-L., WALTERS, E. E. & ZASLAVSKY, A. M. 2002. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, 32, 959-976.
- KESSLER, R. C., BERGLUND, P. A., CHIU, W. T., DEITZ, A. C., HUDSON, J. I., SHAHLY, V., AGUILAR-GAXIOLA, S., ALONSO, J., ANGERMEYER, M. C. & BENJET, C. 2013. The prevalence and correlates of binge eating disorder in the World Health Organization World Mental Health Surveys. *Biological Psychiatry*, 73, 904-914.
- LE GRANGE, D., SWANSON, S. A., CROW, S. J. & MERIKANGAS, K. R. 2012. Eating disorder not otherwise specified presentation in the US population. *International Journal of Eating Disorders*, 45, 711-718.
- MICALI, N., SOLMI, F., HORTON, N. J., CROSBY, R. D., EDDY, K. T., CALZO, J. P., SONNEVILLE, K. R., SWANSON, S. A. & FIELD, A. E. 2015. Adolescent eating disorders predict psychiatric, high-risk behaviors and weight outcomes in young adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*, 54, 652-659.e1.
- MITCHISON, D., HAY, P., ENGEL, S., CROSBY, R., LE GRANGE, D., LACEY, H., MOND, J., SLEWA-YOUNAN, S. & TOUYZ, S. 2013. Assessment of quality of life in people with severe and enduring anorexia nervosa: A comparison of generic and specific instruments. *BMC Psychiatry*, 13, 284.
- MITCHISON, D., HAY, P., SLEWA-YOUNAN, S. & MOND, J. 2014. The changing demographic profile of eating disorder behaviors in the community. *BMC Public Health*, 14.
- MITCHISON, D., TOUYZ, S., GONZÁLEZ-CHICA, D. A., STOCKS, N. & HAY, P. 2017. How abnormal is binge eating? 18-Year time trends in population prevalence and burden. *Acta Psychiatrica Scandinavica*, 136, 147-155.
- MOND, J., HALL, A., BENTLEY, C., HARRISON, C., GRATWICK-SARLL, K. & LEWIS, V. 2014. Eating-disordered behavior in adolescent boys: Eating disorder examination questionnaire norms. *International Journal of Eating Disorders*, 47, 335-341.

- MOND, J. M., HAY, P. J., DARBY, A., PAXTON, S. J., QUIRK, F., BUTTNER, P., OWEN, C. & RODGERS, B. 2009. Women with bulimic eating disorders: When do they receive treatment for an eating problem? *Journal of Consulting and Clinical Psychology*, 77, 835.
- MOYNIHAN, R., BARRATT, A. L., BUCHBINDER, R., CARTER, S. M., DAKIN, T., DONOVAN, J., ELSHAUG, A. G., GLASZIOU, P. P., MAHER, C. G., MCCAFFERY, K. J. & SCOTT, I. A. 2018. Australia is responding to the complex challenge of overdiagnosis. *Med J Aust*, 209, 332-334.
- MULDERS-JONES, B., MITCHISON, D., GIROSI, F. & HAY, P. 2017. Socioeconomic correlates of eating disorder symptoms in an Australian population-based sample. *PLOS ONE*, 12, e0170603.
- MURRAY, S. B., NAGATA, J. M., GRIFFITHS, S., CALZO, J. P., BROWN, T. A., MITCHISON, D., BLASHILL, A. J. & MOND, J. M. 2017. The enigma of male eating disorders: A critical review and synthesis. *Clinical Psychology Review*, 57, 1-11.
- NAGL, M., JACOBI, C., PAUL, M., BEESDO-BAUM, K., HOFER, M., LIEB, R. & WITTCHEN, H. U. 2016. Prevalence, incidence, and natural course of anorexia and bulimia nervosa among adolescents and young adults. *Eur Child Adolesc Psychiatry*, 25, 903-18.
- NOLAN, L. J. & GELIBTER, A. 2012. Night eating is associated with emotional and external eating in college students. *Eating Behaviors*, 13, 202-206.
- PATTON, G. C., COFFEY, C., CARLIN, J. B., SANCI, L. & SAWYER, S. 2008. Prognosis of adolescent partial syndromes of eating disorder. *The British Journal of Psychiatry*, 192, 294-299.
- ROJO-MORENO, L., ARRIBAS, P., PLUMED, J., GIMENO, N., GARCIA-BLANCO, A., VAZ-LEAL, F., LUISA VILA, M. & LIVIANOS, L. 2015. Prevalence and comorbidity of eating disorders among a community sample of adolescents: 2-year follow-up. *Psychiatry Res*, 227, 52-7.
- RUNFOLA, C. D., ALLISON, K. C., HARDY, K. K., LOCK, J. & PEEBLES, R. 2014. Prevalence and clinical significance of night eating syndrome in university students. *Journal of Adolescent Health*, 55, 41-48.
- SCHMIDT, U., ADAN, R., BÖHM, I., CAMPBELL, I. C., DINGEMANS, A., EHRLICH, S., ELZAKKERS, I., FAVARO, A., GIEL, K., HARRISON, A., HIMMERICH, H., HOEK, H. W., HERPERTZ-DAHLMANN, B., KAS, M. J., SEITZ, J., SMEETS, P., STERNHEIM, L., TENCONI, E., VAN ELBURG, A., VAN FURTH, E. & ZIPFEL, S. 2016. Eating disorders: The big issue. *The Lancet Psychiatry*, 3, 313-315.
- SPITZER, R. L. 1998. Diagnosis and need for treatment are not the same. *Archives of General Psychiatry*, 55, 120-120.
- STICE, E., MARTI, C. N. & ROHDE, P. 2013. Prevalence, incidence, impairment, and course of the proposed DSM-5 eating disorder diagnoses in an 8-year prospective community study of young women. *Journal of Abnormal Psychology*, 122, 445.
- STRIEGEL-MOORE, R. H., DOHM, F. A., HOOK, J. M., SCHREIBER, G. B., CRAWFORD, P. B. & DANIELS, S. R. 2005. Night eating syndrome in young adult women: Prevalence and correlates. *International Journal of Eating Disorders*, 37, 200-206.
- STUNKARD, A. J., GRACE, W. J. & WOLFF, H. G. 1955. The night-eating syndrome. *The American Journal of Medicine*, 19, 78-86.
- TRACE, S. E., THORNTON, L. M., ROOT, T. L., MAZZEO, S. E., LICHTENSTEIN, P., PEDERSEN, N. L. & BULIK, C. M. 2012. Effects of reducing the frequency and duration criteria for binge eating on lifetime prevalence of bulimia nervosa and binge eating disorder: Implications for DSM-5. *International Journal of Eating Disorders*, 45, 531-536.
- TROMPETER, N., BUSSEY, K., HAY, P., MOND, J., MURRAY, S. B., LONERGAN, A., GRIFFITHS, S., PIKE, K. & MITCHISON, D. 2018. Fear of negative evaluation and weight/shape concerns among adolescents: The moderating effects of gender and weight status. *Journal of Youth and Adolescence*, 47, 1398-1408.
- UDO, T. & GRILO, C. M. 2018. Prevalence and correlates of DSM-5–defined eating disorders in a nationally representative sample of U.S. adults. *Biological Psychiatry*, 84, 345-354.

- VARNI, J. W., BURWINKLE, T. M., SEID, M. & SKARR, D. 2003. The PedsQL 4.0 as a pediatric population health measure: Feasibility, reliability, and validity. *Ambulatory Pediatrics*, 3, 329-41.
- VARNI, J. W., SEID, M. & KURTIN, P. S. 2001. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med Care*, 39, 800-12.
- VOLPE, U., TORTORELLA, A., MANCHIA, M., MONTELEONE, A. M., ALBERT, U. & MONTELEONE, P. 2016. Eating disorders: What age at onset? *Psychiatry Research*, 238, 225-227.
- WADE, T. D. & O'SHEA, A. 2015. DSM-5 unspecified feeding and eating disorders in adolescents: What do they look like and are they clinically significant? *International Journal of Eating Disorders*, 48, 367-374.

TABLES

Table 1. Operationalisation of DSM-5 Eating Disorder Diagnoses

Diagnosis	Study Criteria
Criterion Eating Disorders	
Anorexia nervosa (AN)	Current BMI percentile < 10; AND persistent extreme weight control behavior (fasting/strict dieting/detox, self-induced vomiting, laxative misuse, driven exercise, or misuse of insulin or other drugs) OR fear of weight gain OR felt fat over the past 4 weeks; AND extreme weight/shape concerns over the past 4 weeks
Probable bulimia nervosa (BN)	At least 4 objective binge eating episodes in past 4 weeks; AND persistent extreme weight control behavior in the past 4 weeks (fasting/strict dieting/detox, self-induced vomiting, laxative misuse, driven exercise, or misuse of insulin or other drugs); AND overvaluation of weight and/or shape over the past 4 weeks; AND not meeting criteria for AN
Probable binge eating disorder (BED)	At least 4 objective binge eating episodes in past 4 weeks; AND binge eating associated with 3 or more features (rapid eating, eating until uncomfortably full, non-hungry eating, eating alone, feeling disgusted/guilty/depressed after eating); AND marked distress regarding the binge eating; AND absence of persistent extreme weight control behavior over the past 4 weeks (fasting/strict dieting/detox, self-induced vomiting, laxative misuse, driven exercise, or misuse of insulin or other drugs); AND not meeting criteria for AN or BN
Other Specified Feeding and Eating Disorder (OSFED)	
Atypical anorexia nervosa (AAN)	Current BMI percentile \geq 10; AND lost weight in the past 4 weeks; AND persistent extreme weight control behavior (fasting/strict dieting/detox, self-induced vomiting, laxative misuse, driven exercise, or misuse of insulin or other drugs) OR fear of weight gain OR felt fat over the past 4 weeks; AND extreme weight/shape concerns over the past 4 weeks; AND not meeting criteria for AN or BN or BED
Subthreshold bulimia nervosa (SBN)	At least 2 objective binge eating episodes in past 4 weeks; AND at least 2 episodes of extreme weight control behavior in the past 4 weeks (fasting/strict dieting/detox, self-induced vomiting, laxative misuse, driven exercise, or misuse of insulin or other drugs); AND overvaluation of weight and/or shape over the past 4 weeks; AND not meeting criteria for AN or BN or BED
Subthreshold binge eating disorder (SBED)	At least 2 objective binge eating episodes in past 4 weeks; AND binge eating associated with 3 or more features (rapid eating, eating until uncomfortably full, non-hungry eating, eating alone, feeling disgusted/guilty/depressed after eating); AND marked distress regarding the binge eating; AND absence of persistent extreme weight control behavior over the past 4 weeks (fasting/strict dieting/detox, self-induced vomiting, laxative misuse, driven exercise, or misuse of insulin or other drugs); AND not meeting criteria for AN or BN or BED
Purging disorder (PD)	No binge eating in the past 4 weeks; AND at least 4 episodes of purging in the past 4 weeks (self-induced vomiting, laxative misuse, detox) [†] ; AND not meeting criteria for AN or BN or BED
Night eating syndrome (NES)	Night time waking and eating with awareness at least once/week OR consumption of the majority of daily intake following supper; AND significant psychological distress OR significant functional impairment; AND not meeting criteria for AN or BN or BED

Unspecified Feeding or Eating Disorder (UFED)

UFED	Persistent binge eating or extreme weight loss behaviour in the past 4 weeks; AND extreme weight/shape concerns over the past 4 weeks; AND significant psychological distress OR significant functional impairment; AND not meeting criteria for AN or BN or BED or OSFED
------	---

† Frequency of purging based on the purging disorder criteria suggested by Keel and Striegel-Moore (2009)

Table 2. Point Prevalence of Eating Disorders and OSFED Syndromes by Gender and with/without a Criterion for Clinical Significance

	Total Prevalence				Prevalence by Gender			<i>p</i>
	<i>n</i>	Raw (%)	With Criterion for Clinical Significance (%)		Boys (%)	Girls (%)	Other (%)	
			Lenient	Stringent				
Anorexia Nervosa (AN)	30	0.7	0.6	0.5	0.0 ^a	1.3 ^b	3.0 ^b	< 0.001
Probable Bulimia Nervosa (BN)	206	4.6	4.6	3.3	1.8 ^a	7.7 ^b	3.0 ^{a,b}	< 0.001
Probable Binge Eating Disorder (BED)	44	1.0	1.0	0.8	0.2 ^a	1.8 ^b	1.5 ^{a,b}	< 0.001
Atypical Anorexia Nervosa (OSFED-AAN)	131	2.9	2.8	2.2	1.2 ^a	4.8 ^b	7.5 ^b	< 0.001
Subthreshold Bulimia Nervosa (OSFED-SBN)	95	2.1	1.8	1.2	1.2 ^a	2.7 ^b	1.8 ^{a,b}	< 0.001
Subthreshold Binge Eating Disorder (OSFED-SBED)	14	0.3	0.3	0.2	0.0 ^a	0.5 ^b	0.0 ^{a,b}	< 0.001
Purging Disorder (OSFED-PD)	146	3.2	2.6	1.5	1.6 ^a	4.8 ^b	4.5 ^{a,b}	< 0.001
Night Eating Syndrome (OSFED-NES)	177	4.1	4.2	2.7	4.9 ^a	3.6 ^a	9.2 ^a	0.020
Unspecified Feeding or Eating Disorder (UFED)	154	3.8	3.8	2.3	1.3 ^a	6.3 ^b	1.6 ^{a,b}	< 0.001
<i>Full Syndrome Eating Disorder</i>	280	6.2	6.2	4.6	2.1 ^a	10.9 ^b	7.5 ^b	< 0.001
<i>Other Specified Feeding or Eating Disorder (OSFED)</i>	486	11.2	10.3	6.6	8.5 ^a	14.5 ^b	21.2 ^b	< 0.001
<i>Any Eating Disorder</i>	920	22.2	20.7	13.6	12.8 ^a	32.9 ^b	31.3 ^b	< 0.001

Note. ^a K-10 > 15 and/or PedsQL Physical or Psychosocial scale score < 1SD below the sample mean. ^b K-10 ≥ 30 and/or PedsQL Physical or Psychosocial scale score < 1SD below the sample mean. †Diagnosis of night eating syndrome and unspecified feeding or eating disorder includes the lenient criterion for clinical significance. All effects of gender were significant ($p < .001$ for all diagnoses except OSFED-BED where $p = .014$ and OSFED-NES where $p = .020$). Based on weighted data. Superscript “a” and “b” indicate statistically significant differences in prevalence estimates between gender groups. Total N for prevalence analyses varied for each diagnosis, dependent on the missingness of diagnostic data (AN: $N = 4534$; BN: $N = 4508$; BED/sBN/sBED/PD: $N = 4505$; AAN: $N = 4494$; NES: $N = 4320$; UFED: $N = 4079$; Major ED: $N = 4509$; OSFED: $N = 4330$; Any ED: $N = 4136$).

Table 3. Adjusted odds ratios for underweight, overweight and obesity relative to healthy weight in adolescents with eating disorders

	AN	BN	BED	AAN	SBN	SBED	PD	NES	UFED
					%, AOR (95% CI)				
Underweight	21.6 (9.9 – 47.1)	0.2 (0.1 – 0.7)	0.3 (0.0 – 2.4)	†	0.5 (0.1 – 1.5)	†	0.5 (0.2 – 1.2)	1.4 (0.8 – 2.4)	†
Overweight	‡	1.3 (0.9 – 2.0)	1.3 (0.6 – 3.1)	1.6 (1.0 – 2.6)	1.5 (0.9 – 2.7)	1.7 (0.5 – 6.1)	1.7 (1.1 – 2.7)	1.0 (0.6 – 1.6)	2.2 (1.5 – 3.3)
Obese	‡	2.3 (1.5 – 3.6)	2.7 (1.2 – 6.1)	2.4 (1.4 – 3.9)	3.2 (1.9 – 5.6)	‡	1.5 (0.8 – 2.6)	1.6 (0.9 – 2.5)	2.5 (1.5 – 4.2)

AOR = adjusted odds ratio. All AORs are adjusted for gender, school grade and migrant status. Weight definitions are from the Center for Disease Control: < 5th % = underweight, 5 to < 85th % = healthy weight, 85th to < 95th % = overweight, ≥ 95% percentile = obese. † No cases of underweight. ‡ No cases of overweight or obese. Based on weighted data (findings unchanged with un-weighted data). AN = anorexia nervosa, BN = probable bulimia nervosa, BED = probable binge eating disorder, AAN = atypical anorexia nervosa, SBN = subthreshold bulimia nervosa, SBED = subthreshold binge eating disorder, PD = purging disorder, NES = night eating syndrome, UFED = unspecified feeding or eating disorder.

FIGURE CAPTIONS

Figure 1a. Point prevalence of DSM-5 eating disorders in adolescent boys. Shaded area indicates other specified and unspecified feeding and eating disorders. AN = anorexia nervosa, BN = probable bulimia nervosa, BED = probable binge eating disorder, AAN = atypical anorexia nervosa, SBN = subthreshold bulimia nervosa, SBED = subthreshold binge eating disorder, PD = purging disorder, NES = night eating syndrome, UFED = unspecified feeding or eating disorder

Figure 1b. Point prevalence of DSM-5 eating disorders in adolescent girls. Shaded area indicates other specified and unspecified feeding and eating disorders. AN = anorexia nervosa, BN = probable bulimia nervosa, BED = probable binge eating disorder, AAN = atypical anorexia nervosa, SBN = subthreshold bulimia nervosa, SBED = subthreshold binge eating disorder, PD = purging disorder, NES = night eating syndrome, UFED = unspecified feeding or eating disorder