Chapter 5

Prevalence and severity of DSM-5 eating disorders in a community cohort of adolescents

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Chapter 5

ABSTRACT

Objective
The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) includes a considerably revised eating disorder section. The aim of this study was to establish the prevalence and severity of eating disorders based on the new DSM-5 criteria in a community cohort of adolescents.

Method
This study is part of TRAILS (TRacking Adolescents’ Individual Lives Survey), a Dutch cohort study on mental health and social development from preadolescence into young adulthood. At baseline, the participants (n=2,230) were about 11 years old. Body mass index was measured at all four assessment waves. At age 19, the Composite International Diagnostic Interview was administered to 1,584 of the participants. A two-stage screening approach was used to estimate the prevalence of DSM-5 eating disorders. Adolescents at high risk for eating disorders (n=312) were selected for an additional interview administered by eating disorder experts.

Results
Of the high-risk group n=296 (95%) could be interviewed. Among the women, the lifetime prevalence of DSM-5 anorexia nervosa was 1.7%, of bulimia nervosa 0.8% and of binge-eating disorder 2.3%. Eating disorders were relatively rare among the men. The severity of most cases was mild to moderate and detection and treatment rates depended on the level of severity.

Discussion
The most common DSM-5 eating disorder diagnoses in adolescents in the community are anorexia nervosa and binge-eating disorder. Severity ratings for eating disorders seem valid in terms of both the distribution in the community and the correlation with detection and treatment by health care services.
INTRODUCTION

The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) was released in May 2013.\(^1\) It includes a significantly revised eating disorder section.\(^2\) The fourth edition, DSM-IV,\(^3\) specified only two eating disorders, anorexia nervosa (AN) and bulimia nervosa (BN). In DSM-5, the eating disorder section is renamed ‘Feeding and Eating Disorders’ and specifies three eating disorders: AN, BN, and binge-eating disorder (BED); and three feeding disorders: pica, rumination disorder (RD), and avoidant/restrictive food intake disorder (ARFID). The DSM-IV listed some of the feeding disorders in the ‘Disorders Usually First Diagnosed in Infancy, Childhood or Adolescence’ chapter.

A major goal of the DSM-5 is to reduce the frequency of the DSM-IV residual category diagnosis ‘eating disorder not otherwise specified’ (EDNOS), a heterogeneous and not well-defined group of eating disorders which includes partial forms of AN and BN, purging disorder, and BED. EDNOS is the most common diagnosis in clinical\(^4\) and community samples of adolescents, accounting in the latter for around 80\% of all eating disorder diagnoses,\(^5,6\) with psychopathology and adverse consequences comparable to AN and BN.\(^7,8\) To achieve the desired reduction of this residual category (renamed ‘other specified feeding and eating disorder’ (OSFED) in the DSM-5), the criteria for AN and BN have been broadened\(^9,10\) and BED has been added as a specified eating disorder. OSFED in the DSM-5 includes atypical AN, BN of low frequency or limited duration, BED of low frequency or limited duration, purging disorder, and night eating syndrome. In addition, the DSM-5 also includes the residual diagnosis ‘unspecified feeding and eating disorder’ when insufficient information is available to assign a more specific diagnosis. Studies evaluating whether the DSM-5 criteria effectively reduce the frequency of the EDNOS diagnosis show mixed results.\(^11-16\) They are limited to treatment-seeking samples\(^12,13,15,16\) or based on the reanalysis of cases previously diagnosed under DSM-IV criteria.\(^14,15\)

Another new feature in the DSM-5 is the introduction of a severity rating for disorders, ranging from mild to extreme, in order to help clinicians track a patient’s progress. Key severity parameters have been defined. Clinicians can increase severity ratings based on the severity of other (undefined) symptoms and the degree of functional disability.\(^1\) The validity of severity ratings has not yet been investigated.

Eating disorders are relatively common in adolescents.\(^7,17\) Little is known about the prevalence of eating disorders when new DSM-5-criteria are applied. To our knowledge, no study has yet assessed the prevalence of DSM-5 eating disorders.
in a community cohort of both female and male adolescents. This study aimed to establish the lifetime prevalence of DSM-5 eating disorders, including severity ratings, in a 10-year follow-up study of a Dutch community cohort of adolescents. The distributions of eating disorder diagnoses according to DSM-5 and DSM-IV criteria were compared. Last, the validity of DSM-5 severity ratings was evaluated by examining their distribution in the community and their correlation with detection and treatment rates by health care professionals.

**METHOD**

**Study design**

A two-stage screening approach was used to estimate the prevalence of DSM-5 eating disorders in a community sample of adolescents. This approach is a widely accepted procedure for the identification of prevalent cases. In the first stage, a group at high risk for an eating disorder was identified (see below for a detailed description of the selection criteria); in the second stage a structured clinical interview by telephone was administered to this group by eating disorder experts, to validate and classify the reported symptoms according to DSM-5 and DSM-IV criteria.

**Study population**

This study is part of a large Dutch prospective cohort study (TRAILS: TRacking Adolescents’ Individual Lives Survey), which follows a community sample from preadolescence into early adulthood. The cohort has been extensively described elsewhere. In 2001, 2,230 children (mean age 11.1 years, SD=0.6) from the north of the Netherlands, selected through community registers and through their schools, were enrolled in the study. The sample includes predominantly white children from five municipalities in both urban and rural areas. Follow-up assessments took place bi- or triennially (second assessment wave: n=2,149, response 96.4%, mean age 13.6 years, SD=0.6; third assessment wave: n=1,816, response 81.4%, mean age 16.3 years, SD=0.7). The cohort completed the fourth assessment wave in 2010 (n=1,881, response 84.3%, mean age 19.1 years, SD=0.6). Informed consent was obtained from the parent(s)/guardian of the participants at the first, second, and third assessment waves, and at the fourth wave from the participants themselves. The Central Dutch Medical Ethics Committee has approved the study.
Selection high-risk group

Adolescents at high risk for eating disorders were selected using measures collected at the fourth assessment wave, which included a comprehensive self-report questionnaire on (mental) health and social functioning, height and weight assessment by means of a standardized measurement procedure, and the Composite International Diagnostic Interview (CIDI) version 3.0,24 a structured diagnostic interview for assessing current and lifetime DSM-IV disorders, administered by trained lay interviewers. See Table 5.1 for number and age of the study population at each stage of the study.

Table 5.1 Number and age of the study population per study stage*

<table>
<thead>
<tr>
<th>Stage</th>
<th>Number of adolescents (%) female</th>
<th>Mean age (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline assessment wave</td>
<td>2,230 (50.8)</td>
<td>11.1 (0.6)</td>
</tr>
<tr>
<td>Fourth assessment wave</td>
<td></td>
<td>19.1 (0.6)</td>
</tr>
<tr>
<td>- Questionnaire** completed</td>
<td>1,714 (54.7)</td>
<td></td>
</tr>
<tr>
<td>- CIDI and/or BMI** completed</td>
<td>1,597 (53.9)</td>
<td></td>
</tr>
<tr>
<td>- CIDI completed</td>
<td>1,584 (54.0)</td>
<td></td>
</tr>
<tr>
<td>- BMI measured</td>
<td>1,560 (53.7)</td>
<td></td>
</tr>
<tr>
<td>High-risk group eating disorders</td>
<td>312 (56.7)</td>
<td>19.1 (0.6)</td>
</tr>
<tr>
<td>Diagnostic interview eating disorders</td>
<td>296 (56.8)</td>
<td>20.6 (0.6)</td>
</tr>
<tr>
<td>- Lifetime DSM–5 FED diagnosis***</td>
<td>62 (80.6)</td>
<td></td>
</tr>
<tr>
<td>- Lifetime DSM–5 ED diagnosis***</td>
<td>58 (84.5)</td>
<td></td>
</tr>
<tr>
<td>- Lifetime DSM-IV ED diagnosis***</td>
<td>45 (84.4)</td>
<td></td>
</tr>
</tbody>
</table>

* This study is part of TRAILS (TRacking Adolescents' Individual Lives Survey), a cohort study on mental health and social development from preadolescence into young adulthood.

** Questionnaire: comprehensive inventory on (mental) health and social functioning; CIDI: Composite International Diagnostic Interview; BMI: body mass index.

*** FED: feeding and eating disorder; ED: eating disorder.

Selection criteria for the high-risk group were based on the core features of an eating disorder: low or high body mass index (BMI), binge eating, compensatory behaviors and a distorted body image.3 These core features were operationalized into 11 selection criteria. Adolescents who met at least one of these criteria were defined as being at high risk. A total of 312 adolescents (177 women / 135 men) fulfilled one or more of the selection criteria; see Table 5.2 for a more detailed description.
**Table 5.2** Selection criteria high-risk group for eating disorders and endorsed proportion in a community cohort of adolescents*

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Variables**</th>
<th>Endorsed* % of women / % of men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>BMI &lt;18.5</td>
<td>4.6 / 7.2</td>
</tr>
<tr>
<td>Obesity</td>
<td>BMI &gt;30</td>
<td>6.3 / 5.0</td>
</tr>
<tr>
<td>Binge eating</td>
<td>CIDI-EA16*** = yes &amp; BMI &gt;27</td>
<td>3.1 / 1.5</td>
</tr>
<tr>
<td>Binge eating + compensatory behaviors</td>
<td>CIDI-EA24 = yes</td>
<td>5.0 / 2.7</td>
</tr>
<tr>
<td>Binge eating + compensatory behaviors: Vomiting</td>
<td>CIDI-EA16 = yes &amp; Vomiting = very true or often true</td>
<td>0.1 / 0.0</td>
</tr>
<tr>
<td>Binge eating + compensatory behaviors: Excessive exercise</td>
<td>CIDI-EA16 = yes &amp; Exercise = more than 60 minutes per day</td>
<td>1.0 / 1.6</td>
</tr>
<tr>
<td>Binge eating + compensatory behaviors: Fasting</td>
<td>CIDI-EA16 = yes &amp; Breakfast frequency = never OR less than once a week</td>
<td>1.4 / 2.6</td>
</tr>
<tr>
<td>Binge eating + compensatory behaviors: Fasting</td>
<td>CIDI-EA16 = yes &amp; Snack frequency = never</td>
<td>0.2 / 0.1</td>
</tr>
<tr>
<td>Distorted body image</td>
<td>CIDI-EA1 = yes &amp; 18.5&lt; BMI &lt;20</td>
<td>2.0 / 0.3</td>
</tr>
<tr>
<td>Distorted body image</td>
<td>Body perception = a little too fat OR much too fat &amp; 18.5&lt; BMI &lt;20</td>
<td>3.3 / 0.0</td>
</tr>
<tr>
<td>Distorted body image</td>
<td>Dieting = yes &amp; 18.5&lt; BMI &lt;20</td>
<td>0.7 / 0.1</td>
</tr>
</tbody>
</table>

* n=1,597 (861 women and 736 men with completed CIDI and/or measured BMI at the fourth assessment wave of the TRAILS study (mean age 19.1 years)). A total of 312 (20.6% of the women and 18.3% of the men) fulfilled one or more of the selection criteria.

** Explanation of variables: BMI: body mass index. CIDI-EA1, CIDI-EA16, CIDI-EA24: Composite International Diagnostic Interview version 3.0 - eating disorders section: items 1 (weight concerns), 16 (binge eating) and 24 (binge eating and compensatory behavior). Vomiting: Adult Self Report (ASR): item 56g. Breakfast frequency, snack frequency, body perception, dieting: questions developed by TRAILS, fourth wave questionnaire.

*** In CIDI-EA16, the CIDI-interviewers were instructed to leave out the frequency and duration criterion (binge-eating episodes at least two times a week for a couple of months). If binge eating was present, the interviewers asked the subsequent questions, regardless of frequency and/or duration.

**Diagnostic interview**

The high-risk group was invited to participate in an interview by telephone, in which the eating disorders module of the Structured Clinical Interview for DSM disorders (SCID-I)\textsuperscript{25,26} and parts of the Eating Disorder Examination (EDE)\textsuperscript{27} were administered by either a resident in psychiatry or a psychologist, both clinically experienced in diagnosing eating disorders. The duration of the interview could take up to one hour, depending on the adolescent’s answers. Of the 312 high-risk adolescents, 296 (a 94.9% response rate) were interviewed over the telephone. One adolescent declined to participate and 15 adolescents could not be reached.
The goals of the interviews by telephone were to obtain current and lifetime diagnoses of feeding and eating disorders according to the DSM-5 and DSM-IV criteria, to define age at onset of the disorder, and to establish whether clinical recovery had occurred and whether the disorder had been diagnosed and treated by a health care professional. Because the SCID-I only covers AN, BN, and EDNOS-BED, skip rules were changed or omitted and questions from the EDE were added in order to diagnose other forms of EDNOS and DSM-5 AN, BN, and BED as well. In order to diagnose the three feeding disorders pica, RD, and ARFID, as well as the disorders listed in the residual category OSFED, diagnostic questions were formulated based on the proposed DSM-5 criteria for these disorders (as temporarily published on www.dsm5.org, accessed December 1, 2010). In order to assess potential eating disorder symptoms that may be more particular to men (e.g., muscle dysmorphia and drive toward muscularity), but which are not well captured in the DSM-IV and SCID-I, we explicitly asked the men about their body image and related self-evaluation, and past and current eating and sporting behaviors. For both men and women, also self-reported highest, lowest, and current weight, and explanations for current and past weight status were assessed. The interviewer wrote a narrative of each interview and the first author (FS) made a provisional diagnosis, also taking into account relevant data from previous assessment waves. All possible and probable eating disorder cases were discussed in a consensus meeting with an eating disorder expert and member of the DSM-5 Eating Disorders Work Group (co-author HWH). In 10 cases, additional information was necessary to establish a definite diagnosis and the respondent was called back to answer additional questions. Possible cases of feeding disorders were discussed with R. Bryant-Waugh, an expert on feeding disorders, also a member of the DSM-5 Eating Disorders Work Group.

For 15 out of 16 non-responders to the telephone interview, data on the eating disorders section of the CIDI (including audio recordings for 13 adolescents) were available and examined to assess whether there was sufficient information to ascertain or rule out an eating disorder diagnosis. This procedure yielded four definite eating disorder cases (two BN and two OSFED). In seven of the non-responder cases an eating disorder was ruled out. There was insufficient information available for five non-responders and these were considered missing.

**Definition of disorder**

Lifetime diagnoses of feeding and eating disorders were established using the DSM-5 criteria for feeding and eating disorders and the DSM-IV criteria for eating
disorders. However, due to the design of this study the focus was specifically on eating disorders, and less on feeding disorders. The diagnosis of feeding disorders, which generally occur in early and middle childhood,\textsuperscript{28} is hampered by recall problems on the part of the adolescents.

Severity of AN, BN, BED, and feeding disorders was rated from mild to extreme in accordance with the DSM-5. For AN, the minimum level of severity is based on BMI (for adults; for children and adolescents on BMI percentiles), and may be increased to reflect clinical symptoms, the degree of functional disability, and the need for supervision. For BN and BED, the minimum severity levels are based on the frequency of inappropriate compensatory behaviors and episodes of binge eating respectively, and may be increased to reflect other (undefined) symptoms and the degree of functional disability. For the residual categories OSFED and ‘unspecified feeding and eating disorder’ and the feeding disorders, an assessment of severity is based on the intensity of physiological, behavioral and social impact parameters, and course of illness. In four cases (two BN and two OSFED), insufficient information was available to evaluate severity; these cases were conservatively labeled as mild.

Age at onset was defined as the age at which the symptoms of the eating disorder first occurred as reported in the diagnostic interview. In order to be classified as clinically recovered, the adolescent had to be asymptomatic for at least one year, here defined as restoration of weight and menstruation (AN, ARFID), and the absence of bingeing and purging for at least one year.\textsuperscript{19,20,29} The one-year asymptomatic interval was chosen based on the literature, showing that for example in the case of BN the likelihood of symptom recurrence only decreases sharply after one year of abstinence from bingeing and purging.\textsuperscript{29} Adolescents who had received an eating disorder diagnosis by a health care professional were considered ‘detected’, regardless of whether the diagnosis was followed by treatment.

Lifetime and point prevalence per DSM-5 and DSM-IV diagnosis were calculated by dividing the identified number of cases by the total number of adolescents who completed the CIDI and/or had their BMI measured at the fourth assessment wave (n=1,597; 1.3% CIDI without BMI; 0.8% BMI without CIDI). Confidence intervals (95%) for lifetime and point prevalences were calculated using exact methods in the statistical program R. Diagnostic crossover is common in eating disorders.\textsuperscript{30} Multiple lifetime diagnoses of eating disorders in one adolescent were only treated as separate eating disorders if there was an asymptomatic interval of at least one year between two subsequent eating disorder diagnoses. When an adolescent did not have a one-year asymptomatic interval in between two different diagnoses,
only the diagnosis highest in the hierarchy of eating disorders (AN-BN-BED-OS-FED) was included in the calculation of lifetime prevalence. The point prevalences include all adolescents with a lifetime diagnosis without clinical recovery at the time of the diagnostic interview.

Fisher’s exact test was used to examine correlations between severity and detection rate, treatment rate, clinical recovery rate, and ANOVA was used to compare mean age at onset between severity categories.

RESULTS

Lifetime DSM-5 eating disorders

A lifetime diagnosis of any DSM-5 eating disorder was established in 5.7% of the female (95% confidence interval (CI): 4.2–7.5) and in 1.2% of the male adolescents (95% CI: 0.6–2.3). Five adolescents had more than one lifetime eating disorder diagnosis; however, none of them had experienced a one-year asymptomatic interval between diagnoses, so all five were only counted once in the prevalences. See Table 5.3 for the number of cases per diagnosis and sex-specific lifetime and point prevalences.

Table 5.3 DSM-5 eating disorders in a community cohort of adolescents*

<table>
<thead>
<tr>
<th>DSM–5 Eating disorder**</th>
<th>Number of cases (% female)</th>
<th>Lifetime prevalence % (95% CI)**</th>
<th>Point prevalence % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>AN</td>
<td>16 (93.8)</td>
<td>1.7 (1.0–2.9)</td>
<td>0.1 (0.0–0.8)</td>
</tr>
<tr>
<td>BN</td>
<td>8 (87.5)</td>
<td>0.8 (0.3–1.7)</td>
<td>0.1 (0.0–0.8)</td>
</tr>
<tr>
<td>BED</td>
<td>25 (80.0)</td>
<td>2.3 (1.4–3.6)</td>
<td>0.7 (0.2–1.6)</td>
</tr>
<tr>
<td>OSFED</td>
<td>7 (71.4)</td>
<td>0.6 (0.2–1.3)</td>
<td>0.3 (0.0–1.0)</td>
</tr>
<tr>
<td>Unspecified FED</td>
<td>2 (100.0)</td>
<td>0.2 (0.0–0.8)</td>
<td>0</td>
</tr>
<tr>
<td>Any ED</td>
<td>58 (84.5)</td>
<td>5.7 (4.2–7.5)</td>
<td>1.2 (0.6–2.3)</td>
</tr>
</tbody>
</table>

* Total n=1,597 (53.9% female) with completed CIDI and/or measured BMI at the fourth assessment wave of the TRAILS study (mean age 19.1 years); mean age at diagnostic interview by eating disorder experts 20.6 years.

** AN: anorexia nervosa; BN: bulimia nervosa; BED: binge-eating disorder; OSFED: other specified feeding and eating disorder; FED: feeding and eating disorder; ED: eating disorder; 95% CI: 95% confidence interval.
The most common diagnoses were AN and BED among the female adolescents, and BED among the male adolescents. However, absolute numbers of cases were small, especially in men, resulting in wide and often overlapping confidence intervals of prevalence estimates. Of the AN cases, 43.8% was classified as restricting subtype and 56.2% as binge/purge subtype. Of the 25 BED cases, 15 (60.0%) were obese (BMI >30) at the fourth assessment wave (mean age 19.1 years). Of all adolescents who were obese at the fourth wave, 16.5% had a lifetime diagnosis of BED. A minority of cases (seven adolescents; 12.1% of all eating disorder diagnoses) fell into the residual category of OSFED (one subthreshold BN, two subthreshold BED, two purging disorder, two night eating syndrome). Two other female adolescents displayed significant symptoms of an eating disorder without matching any of the descriptions in the OSFED category. One of them had extreme weight loss without being underweight and without the typical physiological and psychiatric correlates of AN; the other displayed several disordered eating behaviors accompanied by a self-evaluation unduly influenced by body weight and shape. They were categorized as having an ‘unspecified feeding and eating disorder’ (3.4% of all eating disorder diagnoses). Mean age at onset (SD) was 15.1 (2.8) years for AN, 16.0 (1.9) years for BN and 13.9 (2.4) years for BED. AN had the highest detection (68.8%) and treatment rates (56.3%) (see Table 5.5). Clinical recovery rates at the time of the diagnostic interview were 31.3% for AN, 25.0% for BN, 36.0% for BED, and 57.1% for OSFED.

Four cases of feeding disorders (three ARFID and one pica) with onset in late childhood or adolescence were identified, constituting 6.5% of all lifetime DSM-5 feeding and eating disorder diagnoses (see Table 5.1).

**Comparison of DSM-5 and DSM-IV eating disorder diagnoses**

A lifetime diagnosis of DSM-IV eating disorders was established in 4.4% of the female (95% CI: 3.1-6.0) and 1.0% of the male adolescents (95% CI: 0.4-1.9). The most common diagnosis for both sexes was EDNOS. Among the female adolescents, the lifetime prevalence of DSM-IV AN was 1.2% (95% CI: 0.6-2.1), of BN 0.6% (95% CI: 0.2-1.3), and of EDNOS 2.7% (95% CI: 1.7-4.0). Among the male adolescents, the lifetime prevalence of EDNOS was 0.8% (95% CI: 0.3-1.8). Of the AN cases, 45.5% were classified as restricting subtype and 54.5% as binge/purge subtype. One BN patient exhibited only non-purging compensatory behavior.

Table 5.4 shows the distribution of eating disorder diagnoses according to DSM-5 and DSM-IV criteria. Male and female adolescents combined, the lifetime prevalence of any eating disorder increased with 28.9% under DSM-5 criteria, mainly
attributable to the inclusion of cases of BED who were subthreshold according to DSM-IV. Compared to the DSM-IV, the female lifetime prevalence of DSM-5 AN increased by 50.0% and of DSM-5 BN by 40.0%. According to DSM-IV criteria, 64.4% of all diagnosed cases (male and female) fell into the residual category EDNOS, which dropped to 15.5% for the residual DSM-5 categories OSFED and ‘unspecified feeding and eating disorder’ combined.

**Severity ratings**

Table 5.5 shows the distribution of severity levels, mean severity and detection and treatment rates per DSM-5 feeding and eating disorder diagnosis, and the proportion of detected and treated cases per severity level. Most cases were mild to moderate. AN had the highest detection and treatment rates; BED and the residual categories OSFED and ‘unspecified feeding and eating disorder’ the lowest. We found a statistically significant association between severity and detection rate (Fisher’s exact test, \( p=.02 \)) and between severity and treatment rate (\( p=.002 \)). There was no statistically significant association between severity and clinical recovery rate (38.7% for all feeding and eating disorder diagnoses; \( p=.79 \)). Age at onset did not differ between severity categories (mean age 14.5 years, median 14.5 years, SD=2.6; \( F=0.84, df=3, p=.48 \)).
### Table 5.5 Severity, detection and treatment rates per lifetime DSM-5 feeding and eating disorder diagnosis in a community cohort of adolescents*

<table>
<thead>
<tr>
<th>DSM–5 Feeding and eating disorder**</th>
<th>Severity n (row %)</th>
<th>Mean severity X (SD)***</th>
<th>Detected n (row %)</th>
<th>Treated n (row %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td>Extreme</td>
</tr>
<tr>
<td>AN (n=16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 (31.2)</td>
<td>4 (25.0)</td>
<td>4 (25.0)</td>
<td>3 (18.8)</td>
</tr>
<tr>
<td>BN (n=8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 (62.5)</td>
<td>1 (12.5)</td>
<td>1 (12.5)</td>
<td>1 (12.5)</td>
</tr>
<tr>
<td>BED (n=25)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 (48.0)</td>
<td>10 (40.0)</td>
<td>2 (8.0)</td>
<td>1 (4.0)</td>
</tr>
<tr>
<td>OSFED (n=7)</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>7 (100.0)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ARFID (n=3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 (33.3)</td>
<td>0</td>
<td>2 (66.7)</td>
<td>0</td>
</tr>
<tr>
<td>Pica (n=1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 (100.0)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unspecified FED (n=2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 (100.0)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Any FED (n=62)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33 (53.2)</td>
<td>15 (24.2)</td>
<td>9 (14.5)</td>
<td>5 (8.1)</td>
</tr>
</tbody>
</table>

** Number of detected cases (n=24) (% per severity category)  
Number of treated cases (n=18) (% per severity category)

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* Total n=1,597 (53.9% female) with completed CIDI and/or measured BMI at the fourth assessment wave of the TRAILS study (mean age 19.1 years); mean age at diagnostic interview by eating disorder experts 20.6 years.

** AN: anorexia nervosa; BN: bulimia nervosa; BED: binge-eating disorder; OSFED: other specified feeding and eating disorder; ARFID: avoidant/restrictive food intake disorder; FED: feeding and eating disorder.

*** Severity rating: mild=1; moderate=2; severe=3; extreme=4.
DISCUSSION

To our knowledge, this is the first study to assess DSM-5 eating disorder diagnoses with severity ratings in a community sample of female and male adolescents. The most common diagnoses were AN and BED among the women and BED among the men. BN was rare in our sample. The severity of most cases was mild to moderate and detection and treatment rates depended on the level of severity. Finally, while the lifetime prevalence of any eating disorder increased under the application of DSM-5 criteria, this application appeared to be successful in reducing the size of the DSM-IV residual category EDNOS.

**DSM-5 eating disorders**

The observed lifetime prevalence of 1.7% for DSM-5 AN among the female adolescents in our sample is close to prevalences between 2% and 4% for AN found in previous community studies among adult women using broad definitions of the DSM-IV, which overlap with the DSM-5 criteria.\(^{19,31,32}\)

Compared to studies among US adolescents,\(^{33-35}\) eating disorders with predominantly purging behaviors, such as BN and OSFED-purging disorder, were rare in our sample and less common than AN and BED. Possible explanations include the relatively young age of our sample, who was still in the middle of the high-risk period for BN\(^ {36}\) and an overall decreasing trend in the occurrence of BN over time.\(^ {36,37}\) The prevalence of OSFED-purging disorder in our study may be underestimated because the selection criteria for the high-risk group of eating disorders did not include isolated purging behaviors without the presence of binge eating. Cultural explanations for differences in prevalence between our study and studies in the United States include differences in ethnic composition of the samples,\(^ {38}\) urbanization,\(^ {39}\) over-the-counter availability of purging medications (such as diuretics and laxatives), and household composition. Our sample is predominantly white, while other studies might have included a larger proportion of respondents from ethnic minority groups.

The observed lifetime prevalence for BED of 2.3% among the women is comparable to other studies among female adolescents.\(^ {34,35}\) Recent epidemiological studies among adolescents\(^ {33-35}\) indicate that BED is more common among adolescents than previously thought.\(^ {40}\) The majority of DSM-5 BED cases in our sample had mild to moderate severity ratings.

Although we diagnosed four cases of feeding disorders with onset in late childhood or adolescence, we expect the true prevalence to be higher due to our study...
design, which is not optimal for detecting feeding disorders. Methodological problems include the selection criteria for the high-risk group that insufficiently capture feeding disorder symptoms, and recall problems of the adolescents. Parent interviews could provide a valuable contribution to the detection of feeding disorders.

Only one male case of AN was found, compared to 15 female cases. For BED, a male-female ratio of 1:3.4 was observed, quite similar to the ratio found in a large population sample of US adolescents. However, due to small numbers of cases in our study, especially in men, male-female ratios should be interpreted with caution. For example: when taking into account (unrounded) confidence intervals, the male-female ratio of BED ranges from 1:1 to 1:16.

Comparison of DSM-5 and DSM-IV eating disorder diagnoses
The lifetime prevalence of any eating disorder for male and female adolescents combined increased by 28.9% under the DSM-5 criteria, mainly attributable to the inclusion of BED cases that were subthreshold according to DSM-IV criteria. Population studies among adults found small increases in the prevalence of BED under the DSM-5 criteria. The validity of DSM-5 BED classification has been criticized for setting the threshold for a psychiatric disorder too low. However, studies among adolescents indicate that binge eating with a frequency of at least once a week is a predictor for negative outcomes, such as the development of overweight/obesity and depressive symptoms and the onset of drug use. The question of where to place the cut-off between problematic behavior and disorder remains though. Often, one of the features of a mental disorder is the presence of distress and/or functional disability. The ‘distress criterion’ (Criterion C in BED) needs to be met in order to establish a diagnosis of BED. The presence of distress in each possible case was extensively discussed in our diagnostic consensus meetings in order to make sure that a diagnosis of (subthreshold) BED was limited to adolescents who displayed the full syndrome and not only the symptom ‘binge eating’.

In our sample, the lifetime prevalence of AN and BN among female adolescents increased by 50.0% and 40.0%, respectively, with the use of DSM-5 criteria. Earlier community studies have suggested that the lifetime prevalence of AN among women doubled when the amenorrhea criterion was dropped, in line with the DSM-5 criteria for AN. In a community sample of female high school and university students, the point prevalence of AN increased by 61% when DSM-5 criteria were used. Using the DSM-5 criteria and relaxing the requirement for
binge and compensation frequency from two to one per week, the prevalence of BN increased by 30% in several community studies.\textsuperscript{14,20,42}

The DSM-5 criteria for eating disorders effectively reduced the contribution of the residual category, from 64.4% (DSM-IV EDNOS) to 15.5% (DSM-5 OSFED and ‘unspecified feeding and eating disorder’ combined). Other studies evaluating whether the DSM-5 criteria effectively reduce the proportion of the EDNOS category also show a reduction of the residual category,\textsuperscript{11-16} however, none as large as the reduction in our sample.

**Severity ratings**

As was to be expected for a community cohort, the majority of feeding and eating disorder cases had mild to moderate severity. This finding, combined with the observation that a significant association exists between severity and the proportion of cases detected and treated by (mental) health care services, provides evidence that the DSM-5 severity ratings are valid. We found no difference in age at onset between severity categories, reflecting that age at onset is probably more disorder- than severity-dependent. Neither did we find a correlation between severity and the proportion of clinically recovered cases. This could be explained by the relatively young age of our sample, combined with a high threshold for clinical recovery. In other words: it might simply be too early to tell if severity correlates with clinical recovery rate. Moreover, cases that were labeled mild at the time of the diagnostic interview might just have been in the early stage of the disorder, and progress to a more severe level over time. In the next assessment wave of this cohort study we hope to examine how severity ratings develop over a longer follow-up period, and how they correlate with other measures, e.g., quality of life.

**Strengths and limitations**

Strengths of this study include its community-based design, including both female and male adolescents. Eating disorder experts administered diagnostic interviews and participated in diagnostic consensus meetings. Response rates were high, and we managed to confirm or rule out an eating disorder diagnosis for the majority of non-responders. Diagnoses were made on the basis of all available information, including data collected in previous assessment waves.

However, this study also has several limitations. First, possible selection bias of the study sample: non-responders at the fourth assessment wave (n=349; 15.6% of the baseline sample) were more likely to be male, and, compared to responders, they more often had divorced parents, a low educated mother, low family income,
low socioeconomic position, low academic achievement, and low peer status at the first assessment wave. Also, non-responders more often used tobacco and cannabis than responders. In a previous study among US adolescents, measures of socioeconomic status, such as parental education, household income and parental marital status were not significantly associated with any eating disorder presentation, while substance abuse was associated with BN and BED. We therefore believe that BN and BED may be slightly underestimated in our study.

Second, some limitations pertain to the first stage of case finding: the selection of the high-risk group for eating disorders. In order to fulfill the dimension ‘binge eating’, the adolescents had to answer yes to the item on binge eating in the CIDI-interview, in combination with having a BMI >27 at age 19. We decided on a minimum BMI in order to increase the specificity of the selection criterion and the likelihood of problematic behavior. We might have missed instances of BED in adolescents who had a BMI <27 at age 19, and were unselected for that reason. According to De Zwaan, 50% of BED cases in community samples are overweight. Thus, our estimate of the prevalence of BED might double when normal-weight adolescents would have been included in the high-risk definition of binge eating. Our lifetime prevalence of BED has therefore to be regarded as a minimum estimate. Also, purging behaviors were assessed only in combination with binge eating, which might have led to an underestimation of OSFED-purging disorder.

Third, a limitation of the second stage of the study - the diagnostic interview – is the fact that it was administered by telephone rather than in person, thereby excluding the interpretation of potentially important non-verbal information and the opportunity to measure current weight and height. However, a telephone interview was advantageous in that it required a smaller effort from the participant, and was more anonymous than a face-to-face interview would have been, resulting in seemingly frank answers on questions about shameful and secretive behaviors, such as binge eating. Moreover, weight and height had been measured in person at all assessment waves of the study. Another limitation pertains to determining age at onset of the eating disorder: because the development of an eating disorder is usually a gradual process, it is difficult to pinpoint the onset in time. Last, recall problems play a role, even in our relatively young study population.
CONCLUSIONS

AN and BED are the most common eating disorders among adolescents, especially the mild forms. In DSM-5, the proportion of diagnoses in the residual category EDNOS is effectively reduced. Severity ratings for eating and feeding disorders seem valid in terms of distribution in the community and correlation with detection and treatment by (mental) health care services.

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