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Adolescent Eating Disorders Predict Psychiatric, High-Risk Behaviors and Weight Outcomes in Young Adulthood

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Abstract

Objective—To investigate whether anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), and other specified feeding and eating disorders (OSFED), including purging disorder (PD), subthreshold BN, and BED at ages 14 and 16, are prospectively associated with later depression, anxiety disorders, alcohol and substance use, and self-harm.

Method—Eating disorders were ascertained at 14 and 16 years of age in 6,140 youth at age 14 (58% of those eligible) and 5,069 at age 16 (52% of those eligible) as part of the prospective Avon Longitudinal Study of Parents and Children (ALSPAC). Outcomes (depression, anxiety disorders, binge drinking, drug use, deliberate self-harm, weight status) were measured using interviews and questionnaires about 2 years following predictors. Generalized estimating equation models adjusting for gender, socio-demographic variables, and prior outcome were used to examine prospective associations between eating disorders and each outcome.

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Results—All eating disorders were predictive of later anxiety disorders. AN, BN, BED, PD, and OSFED were prospectively associated with depression (respectively AN: odds ratio [OR]=1.39 [95% CIs: 1.00-1.94]; BN: OR=3.39[1.25-9.20]; BED: OR=2.00 [1.06-3.75]; PD: OR=2.56 [1.38-4.74]). All eating disorders but AN predicted drug use and deliberate self-harm (BN: OR=5.72[2.22-14.72], PD: OR=4.88[2.78-8.57], subthreshold BN: OR=3.97[1.44-10.98], subthreshold BED: OR=2.32[1.43-3.75]). Whilst BED and BN predicted obesity (respectively OR=3.58 [1.06-12.14] and OR=6.42 [1.69-24.30]), AN was prospectively associated with underweight.

Conclusions—Adolescent eating disorders, including subthreshold presentations, predict negative outcomes, including mental health disorders, substance use, deliberate self-harm, and weight outcomes. This study highlights the high public health and clinical burden of eating disorders among adolescents.

Keywords

ALSPAC; eating disorders; outcomes; psychiatric; weight

Introduction

Eating Disorders (ED) have a peak onset in adolescence[1] and affect about one in ten adolescent females[2,3]. Given the high prevalence of the *DSM-IV*[4] "not otherwise specified" ED category in clinical and population-based samples, the *DSM-5*[5] revised diagnostic criteria so that fewer patients would be classified in this category. Thus, the *DSM-5* includes less stringent criteria for anorexia nervosa (AN) and bulimia nervosa (BN) and recognizes binge eating disorder (BED) as a distinct diagnosis. Despite these changes, evidence suggests that "other specified feeding and eating disorders" (OSFED) remains the most common diagnosis amongst youth[6,7].

ED are associated with high morbidity and mortality[8,9]. However, most studies to date have exclusively investigated AN and BN or have relied on clinical samples or patient registers that are not representative of individuals with ED in the general population[10]. Moreover, most studies have focused on adults, and little is known of adverse outcomes of adolescent ED, despite adolescence being a critical developmental period[1]. The paucity of available evidence from population-based studies limits our understanding of the impact of the whole range of ED (including subthreshold presentations) on physical and mental health and behavioral outcomes amongst adolescents.

We recently showed, in a US cohort, that the most common ED amongst adolescent girls (i.e. BED, purging disorder [PD] and OSFED-other) are prospectively associated with depressive symptoms, drug use, binge drinking, and overweight/obesity[2].

Given that many youth with OSFED do not access treatment[3], nor receive a diagnosis, a high resulting burden of disease is likely to occur at a population level that is not readily apparent from clinical samples. Thus, understanding the outcomes of common adolescent ED presentations in the community will not only improve knowledge of course and outcome of behaviors and syndromes unlikely to come to clinical attention, but may also highlight the

need for targeting public health efforts to a large proportion of the population that has historically not otherwise been reached.

We therefore aimed to investigate the prospective association of ED with a wide range of psychopathology (depression, anxiety, deliberate self-harm, binge drinking, and drug use), and weight outcomes amongst boys and girls from a population-based UK sample. We also investigated whether youth with OSFED with higher (> monthly) versus lower (<monthly) frequency of behaviors had worse outcomes, given uncertainties about frequency cut-offs used in diagnostic manuals.

Method

Participants

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a longitudinal, population-based, prospective study of women and their children[11]. All pregnant women living in the geographical area of Avon, UK, expected to deliver between 1st April 1991 and 31st December 1992 were invited to participate in the study. Children from 14,541 pregnancies were enrolled; 13,988 children were alive at 1 year. An additional 713 children were enrolled at age 7 (Phases 2 and 3)[11]. All women gave informed and written consent. Amongst twin pairs, one twin per pair was randomly excluded.

We included youth based on participation to two waves of data collection: at child age 14 years (Wave 14+) and 16 years (Wave 16+). At Wave14+ 10,581 and at Wave16+ 9,702 adolescents were eligible for follow-up (i.e. had not withdrawn consent and were contactable for data collection when questionnaires were sent out)[11] and were sent questionnaires; of these, 6,140 (58%) and 5,069 (52%) respectively completed questionnaires.

Data were also available from parental questionnaires on 7,025 adolescents at Wave 14+ and on 5,656 at Wave 16+.

A fully searchable ALSPAC data dictionary is available: http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/

Measures

Eating Disorders—ED diagnoses were derived using questionnaire data from adolescents (and parents for AN) at Waves14+ and 16+, and objective body mass index (BMI) from weight and height collected at face-to-face assessments (median ages 13.8 years and 15.5 years).

Data on ED behaviours were collected using questions adapted from the Youth Risk Behavior Surveillance System questionnaire[12] enquiring about the previous year. Binge eating was assessed as present amongst adolescents who reported eating a very large amount of food ≥once/week, and feeling out of control during these episodes. Purging was assessed by asking how often in the past year the adolescent made him/herself sick or used laxatives to lose weight or avoid gaining weight. Both questions have been validated in an adolescent

population-based sample[13]. Fasting was assessed with one question: "During the past year, how often did you fast (not eat for at least a day) to lose weight or avoid gaining weight?"

A three-part question was used to define excessive exercise. Youth engaging in exercise for weight loss or to avoid weight gain who reported: a) finding it hard to do any chores/ schoolwork due to the time spent exercising, or b) exercising even when sick or injured, or c) feeling guilty about missing an exercise session were coded as engaging in excessive exercise.

Weight and shape concern was ascertained at age 14 only, using three questions from the McKnight Risk Factor Survey[14] to derive a dichotomous variable[15].

ED classifications were derived using *DSM-5* criteria (see Table 1). In addition we defined two categories of OSFED-other: 1 and 2, the former being assigned to youth who did not meet criteria for all other disorders but reported ED behaviors ≥monthly; the latter to those who reported any ED behaviors at < monthly frequency (with shape and weight concern at 14 years). Given evidence that young people often deny AN symptoms (such as fear of fatness and restrictive eating), and that the use of parental report can overcome this[16], parental report of AN symptoms on a validated instrument–Development and Wellbeing Assessment (DAWBA)[17]–at Wave 14+ and 16+ (see[18] for details) was used in addition to self-report to define AN.

Underweight was determined using age, gender, and BMI-specific cutoffs (based on UK reference data)[19] corresponding to World Health Organization (WHO) grade 1 thinness[20].

Outcomes

Data on outcomes were obtained at Wave16+ and at age 18 years (Wave18+) from questionnaires (depression and drug and alcohol use), and at ages 15.5 and 17.5 years from validated semi-structured computerized interviews at face-to-face assessments (15.5 years: using the DAWBA[17]; 17.5: using the Clinical Interview Schedule-Revised [CIS-R][21]). These outcomes have been studied in depth in the ALSPAC cohort (see[11]).

Figure S1, available online, outlines timing of predictors and outcome assessments. *Depressive symptoms:* measured using the short Moods and Feelings Questionnaire, a validated 13-item tool for youth[22-23]. A cut-off of 8 was used to define clinically relevant symptoms, indicating a depressive disorder[24].

Drug use: participants were asked about use of cocaine, crack, sedatives, opioids, inhalers, amphetamines, hallucinogens, or other drugs in the previous year. Youth reporting any drug use in the past year were classified as having used drugs.

Binge drinking drinking habits were assessed using the Alcohol Use Disorders Identification Test (AUDIT),[25] a short questionnaire to screen for problematic drinking. Binge drinking was defined as drinking ≥6 units of alcohol on one occasion at least monthly in the previous year.

Anxiety disorders: diagnoses were obtained from the DAWBA[17,26] anxiety disorders section at 15.5 years, and from the CIS-R[21] at 17.5 years.

Deliberate self-harm (DSH): defined as having self-harmed at least once in the prior month (from the DAWBA)[17] at 15.5, and reporting any acts of self-harm in the past year at 17.5 years.

Weight status (underweight, overweight, and obese): BMI was calculated from objective weight and height at face-to-face assessments at ages 15.5 and 17.5 years. Underweight was classified as above; overweight and obese categories were obtained using age- and gender-adjusted cut offs for adolescents (from the International Obesity Task Force)[27].

Covariates

Data on maternal educational level and parity were obtained at recruitment. Presence of each outcome (depression, alcohol use, drug use, anxiety disorder, and BMI) at baseline (14 years) was included in relevant models for each outcome as a covariate. The presence of a diagnosis of depression and anxiety disorders prior to 14 years (7, 10, and 13 years) from parental report (DAWBA)[17] was included when investigating depression, anxiety disorders, and DSH (prior depression) and anxiety disorders (prior anxiety and depression). BMI at 14 years was included in weight outcome analyses. Smoking, obtained from adolescent questionnaires, was included as a predefined covariate in analyses of binge drinking, given the evidence on high co-occurrence of these behaviors amongst adolescents[28].

Data Analyses

ED were analyzed as time-varying predictors. The odds of presenting any of the outcomes—depression, drug use, binge drinking, anxiety disorders, DSH, weight status at the following wave (16+ and 15.5 years for Wave 14+ predictors, 18+ and 17.5 years for Wave 16+ predictors)—was estimated using generalized estimating equations (GEE) models[29,30] with an unstructured working correlation structure and a robust estimation of standard errors. All analyses were adjusted for covariates as described above. Wave of assessment was included as a covariate in all models.

Attrition

Availability of outcome data varied by assessment wave (see Table S1, available online). Complete data on predictors and outcomes were available on 2,214-4,254 adolescents depending on wave, predictor, or outcome. Non-response in ALSPAC is predicted by socioeconomic status (SES) and child gender[11]. Maternal education (as a proxy for SES), parity, and child gender were included as covariates in all analyses.

Missing data on alcohol and drug use at Wave18+ was predicted respectively by using alcohol or drugs at the previous wave (drug use: odds ratio [OR]=2.17; binge drinking: OR=1.41). Missing data on depression, anxiety disorders, and DSH were not predicted by presence of each outcome at the previous wave.

Presence of an ED at Wave 16+ was associated with lower likelihood of missing data on binge drinking and depression at Wave 18+. Data on maternal education and parity were

missing for 638 and 632 cases, respectively. Missing data on covariates were imputed using multiple imputation by chained equations with 25 imputation sets implemented in Stata13 (Stata Corp, 2013) assuming missing at random (MAR)[31], as described in[30]. All predictors and outcome variables were used in the imputation models. All analyses were conducted in Stata 13 (Stata Corp, 2013).

Ethical Approval

Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the local research ethics committees.

Results

Socio-demographic data of adolescents included in the study are shown in Table 2.

Prevalence of ED

At Wave 14+, 2.5% youth met *DSM-5* criteria for AN, but BN, BED, and PD were rare. OSFED was the most common ED: 7.5% of patients engaged in monthly ED behaviors (OSFED-other1) and 6.4% of patients in less frequent ED behaviors (OSFED-other2) (Table 3). Prevalence of ED was 2-3 times higher at Wave 16+ compared to 14+, even when excluding OSFED-other (5.03 to 9.13%); AN remained the most prevalent full-threshold ED. Approximately 3.2% had subthreshold BN, 12.1% OSFED-other 1, and 15.9% OSFED-other 2 (Table 3).

Adverse Mental Health Outcomes

Adolescents with AN were more likely to have later depression (OR=1.39 [95%CI: 1.00-1.94]) and anxiety disorders (OR=2.04 [95%CI:1.09-3.82]) (Table 4). Those with BN had higher odds of reporting depression (OR=3.39 [95%CI:1.25-9.20]), anxiety disorders (OR=7.13 [95%CI:3.08-16.48]), drug use (OR=5.81[95%CI:2.13-15.84]), and DSH (OR=5.72[95%CI:2.22-14.72]) compared to adolescents with no ED. Subthreshold BN and PD were prospectively associated with anxiety disorders, drug use, and DSH (Table 4), and BED with later depression, anxiety disorders, and drug use (respectively: OR=2.00 [95%CI: 1.06-3.75]; OR=3.53 [95%CI:1.58-7.86]; OR=3.39 [95%CI:1.35-8.48]). Subthreshold BED was similarly associated with depression, anxiety disorders, drug use, and DSH (Table 4).

Although engaging in ED behaviors at different frequency cutoffs, adolescents with OSFED-other1 and OSFED-other2 were similarly associated with depression, anxiety disorders, drug use, and DSH (Table 4).

Weight Status

Adolescents with AN were likely to remain underweight at the following wave (adjusted OR=2.43 [1.62-3.66], $p \leq .0001$). In contrast, adolescents with BED and BN had higher odds of being obese compared to adolescents without ED (BN: OR=6.42[1.69-24.30], $p \leq .001$); BED: OR=3.58[1.06-12.14], $p=.04$).

Table 5 shows the prospective association of ED and being overweight or obese (grouped together) at the next wave: BN and OSFED-other were associated with being overweight or obese (Table 5).

Discussion

ED were common in this large UK population-based study and almost doubled in prevalence between ages 14 and 16 years. ED that did not reach full *DSM-5* diagnostic thresholds were the most common. It is difficult to compare prevalence estimates in this study with our US study due to different study design (birth cohort where all youth have a similar age in ALSPAC vs. a wider age gap in the Growing Up Today Study [GUTS]), and of criteria used for diagnoses (binge eating ≥ once/week and cognitive symptoms used for a BED diagnosis vs. binge eating ≥ once/week in GUTS).

Both full and subthreshold ED were strongly associated with later adverse mental health outcomes, substance use, and self-harm. The association between ED, drug use, and DSH was stronger amongst binge-purge and purge-only–type ED (BN, subthreshold BN, PD). All ED, except AN and BED, were strongly predictive of DSH. Adolescents with AN were more likely to remain underweight at later waves. BN and OSFED were associated with overweight and obesity and BED with later obesity.

Youth engaging in ED behaviors even occasionally (<monthly) had increases in odds of adverse outcomes, relative to youth without ED, comparable to those with a higher behavior frequency. It remains unclear whether treatment is warranted for these two groups of OSFED.

Current findings are consistent with our previous findings on US girls[2] in relation to purging-type ED (PD, BN, and subthreshold BN) being prospectively associated with drug use and depression. ED are known to be comorbid with depression, and depression has been shown to predate ED onset in some studies[31], and onset following ED in other studies[32].

This study is the first to assess and detect a prospective association between ED and DSH. Cross-sectional studies have shown the high comorbidity between DSH/suicidal ideation and ED amongst adolescents and adults in the community[3,33]; however, these studies do not allow precedence and timing of onset of comorbidities to be disentangled. We found that adolescents with an ED were 2- to 6-times more likely to engage in DSH 1.5 years later. A cross-sectional study, whilst highlighting the strong association between suicidality and BN, suggested a temporal ordering whereby retrospectively-reported onset of BN was likely to precede suicidality[33]. Our study confirms these findings using longitudinal data and extends them to other ED, underscoring the need to investigate self-harm in the context of binge/purge-type ED both clinically and in future research. Impulsivity, which is known to characterize both binge/purge disorders and DSH, might explain this association. DSH is an important public health concern, given that it is common[34], it is associated with low rates of help-seeking[35], and if untreated, may lead to suicide[36].

This is the first study to our knowledge to prospectively investigate psychopathology and weight outcomes of adolescent AN in the community. The prevalence of AN in our study

was slightly higher than recent studies of adolescents using *DSM-5* criteria[7] (lifetime prevalence: 1.7% in females, 0.1% in males) but comparable to a Finnish population-based study of 16-year-old females [37] (broadly defined AN lifetime prevalence: 4.2%). It is possible that our study yielded a higher prevalence due to reliance on both parental and adolescent report, as half of the adolescents diagnosed with AN at age 14 were identified from parental report only. It is possible that either our sample includes adolescents with less severe AN compared to other studies (although all adolescents with AN were underweight), or previous studies have underestimated the prevalence of AN. Our findings that both parental and youth report of fasting and thinness were similarly predictive of weight outcomes[38] corroborates the latter hypothesis. AN was more prevalent at 14 and 16 years compared to BN; however, this might be a reflection of the ages under study, given that BN onset peaks later than AN[1,2]; in fact, BN and subthreshold BN trebled in prevalence between 16 and 14 years, suggesting that BN behaviors onset at a later age compared to AN behaviors.

Adolescent AN showed a distinct pattern of prospective associations compared to other ED, as would be expected from extant literature suggesting an overlap between emotional disorders and AN[39-41], with some studies showing anxiety onset predating AN and others following onset of AN[42,43]. However, the prospective association of binge/purge-type ED with anxiety disorders is novel and requires replication.

Disorders involving binge eating (BED, BN, and OSFED) predicted overweight and/or obesity at later waves, even after accounting for baseline BMI, confirming reported cross-sectional associations[44]. The combined prevalence of these disorders means that a nontrivial percentage of adolescents may be at increased risk for obesity. Given the high public health, societal, and personal health burden of obesity,[45-46] prevention of obesity among adolescents should also address ED.

In contrast to our previous study,[2] we did not find an association between ED and binge drinking. Binge drinking was very common in this sample, and its high prevalence amongst UK adolescents[47] might be linked to social/cultural factors rather than specific psychopathology.

Lastly, our findings show that independent of ED behavior frequency, adolescents with OSFED are at risk for a wide range of adverse outcomes.

Although broader (and therefore potentially improves access to treatment for a number of individuals with ED), the current *DSM-5* ED classification does not fully capture the range of ED in the community. It is hoped that the WHO will follow suit in the upcoming revision of the *International Classification of Diseases (ICD)*, and that future revisions to diagnostic classifications will consider lowering frequency thresholds of ED behaviors.

This study is the first of its nature in the UK. It has several strengths, including its sample size, population-based nature, length of follow-up, and wide range of outcomes collected using objective measures, semi-structured interviews, and questionnaires. All our analyses were lagged and included baseline presence of each outcome to account for baseline cross-sectional associations.

Some limitations should, however, be considered. Firstly, although ALSPAC is representative of the area of southwest England where the study is based, the sample is mostly Caucasian. Secondly, as is common in longitudinal birth cohorts, this study suffered from selective loss of more disadvantaged families[11], potentially affecting generalizability. We observed selective attrition at Wave18+ for drug use and binge drinking, suggesting differential loss to follow-up bias in favor of less affected individuals, possibly leading to an underestimation of effect for these two outcomes. However, response rates in ALSPAC are comparable to other population-based longitudinal studies[48,49]; higher compared to population-based studies in which participants with psychiatric disorders are oversampled (~44%)[50]; and lower than longitudinal studies that selectively recruited females starting in adolescence (~84-87%)[51,52]. Adolescents with ED at age 16 were less likely to be lost to follow-up in relation to binge drinking and depression; this could have led to an overestimation of effect. Given the lack of evidence of an association with binge drinking, any resulting overestimation would apply only to findings on depression. Post hoc sensitivity analyses, however, showed similar strength of association between ED at Wave14+ and depression at Wave16+ and ED at Wave 16+ and depression at Wave18+.

Thirdly, despite the large sample size, some of our exposures (e.g. BN) and outcomes (e.g. DSH) were uncommon, leading to less precise estimates.

Lastly, although we were able to supplement self-reported data with parental report and objective BMI assessments, ED diagnoses were mostly based on questionnaire data. However, questions on ED behaviors used in this study were validated using interview measures[13].

Nevertheless, our findings strongly suggest that adolescent ED, across the spectrum and independent of frequency of behaviors, are associated with later adverse psychopathology, substance use, self-harm, and weight outcomes. Targeting adolescents with ED and ED behaviors in the community, firstly by improving identification,[53] and secondly by delivering low-intensity early intervention programs,[54] might lead to high public health benefit. Although more research in population-based samples needs to address the distribution and impact of less-studied ED, future *DSM* revisions and upcoming *ICD* revisions should take into consideration removing or lowering frequency thresholds of ED behaviors across diagnostic subtypes and the inclusion of purging disorder as a diagnostic entity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Criteria Used to Diagnose Eating Disorder (ED)

		Wave 14	Wave 16
Anorexia Nervosa (AN)	Self-report	1.Underweight (body mass index [BMI]<18.5) AND 2.self-reported weight and shape concern OR engaged in fasting for weight loss or to avoid weight gain at least monthly OR engaged in excessive exercise	1.Underweight (BMI<18.5) AND 2.engaged in fasting for weight loss or to avoid weight gain at least monthly OR engaged in excessive exercise
	Parental report	1.Underweight (BMI<18.5) AND 2.Presence of fear of weight gain AND fat avoidance in the 3 months prior to assessment	1.Underweight (BMI<18.5) AND 2.Presence of fear of weight gain AND fat avoidance in the 3 months prior to assessment
Bulimia Nervosa (BN)		1.Weekly binge eating AND 2.weekly purging	1.Weekly binge eating AND 2.weekly purging
Binge Eating Disorder (BED)		1.Weekly binge eating AND 2.At least 3 cognitive symptoms (eating fast or faster than normal; eating until stomach hurt or they felt sick, eating large amounts when not hungry, eating alone, feeling guilty about amount eaten) AND 3.Absence of purging	1.Weekly binge eating AND 2.At least 3 cognitive symptoms (eating fast or faster than normal; eating until stomach hurt or they felt sick, eating large amounts when not hungry, eating alone, feeling guilty about amount eaten) AND 3.Absence of purging
Purging Disorder (PD)		1.Purging at least weekly AND 2.Binge eating absent or < monthly	1.Purging at least weekly AND 2.Binge eating absent or < monthly
Sub-threshold BN (Sub-BN)		1.monthly binge eating AND 2.monthly purging	1.monthly binge eating AND 2.monthly purging
Sub-threshold BED (Sub-BED)		1.monthly binge eating AND 2.At least 3 cognitive symptoms AND 3.Absence of purging	1.monthly binge eating AND 2.At least 3 cognitive symptoms AND 3.Absence of purging
Other Specified Feeding and Eating Disorder-other 1 (OSFED-other 1)		monthly binge eating, purging, excessive exercising or fasting	monthly binge eating, purging, excessive exercising or fasting
Other Specified Feeding and Eating Disorder-other 2 (OSFED-other 2)		< monthly binge eating, purging, excessive exercise or fasting AND weight and shape concern	< monthly binge eating, purging, excessive exercise or fasting

J Am Acad Child Adolesc Psychiatry. Author manuscript; available in PMC 2016 August 01.

Table 2

Socio-Demographic Characteristics of Adolescents

	Wave 14+ (n=6,140)	**Wave 16+ (n=5,069)**
Age in years, Mean (SD)	14.0 (0.19)	16.7 (0.24)
Gender, n (%):		
Females	3,416 (55.5%)	3,059 (58.7%)
Males	2,742 (44.5%)	2,154 (41.3%)
Maternal education, n (%):		
A-level or university degree	2,484 (40.3%)	2,209 (42.4%)
Up to GCSE	3,008 (48.8%)	2,366 (45.4%)
Missing	*66 (10.8%)*	*638 (12.2%)*
Child ethnicity, n (%):		
Caucasian	5,372 (87.2%)	4,482(86.0%)
Other	111 (1.8%)	83 (1.6%)
Missing	*675 (11.0%)*	*648 (12.4%)*
Maternal parity, n (%):		
Primiparae	2,620 (42.5%)	2,219 (42.6%)
Multiparae	2,889 (46.9%)	2,362 (45.3%)
Missing	*649 (10.5%)*	*632 (12.1%)*

Note: GCSE = general certificate of secondary education.

Table 3

Prevalence of Eating Disorders Amongst the Avon Longitudinal Study of Parents and Children (ALSPAC) Adolescents at Each Wave

	Wave 14+ (n=6,140) n (%)			Wave 16+ (n=5,069) n (%)		
	All (n=6,140)	**Girls (n=3,416)**	**Boys (n=2,742)**	**All (n=5,069)**	**Girls (n=3,059)**	**Boys (n=2,154)**
AN	153 (2.48)	109 (3.19)	44 (1.60)	91 (1.75)	72 (2.35)	19 (0.88)
BN	16 (0.26)	14 (0.41)	2 (0.07)	42 (0.81)	41 (1.34)	1 (0.05)
BED	30 (0.50)	21 (0.61)	9 (0.33)	60 (1.15)	47 (1.54)	13 (0.60)
PD	26 (0.42)	21 (0.61)	5 (0.18)	80 (1.53)	75 (2.45)	5 (0.23)
Subthreshold BN	82 (1.33)	58 (1.70)	24 (0.88)	168 (3.22)	137 (4.48)	31 (1.44)
Subthreshold BED	2 (0.03)	1 (0.03)	1 (0.04)	22 (0.42)	22 (0.72)	0
OSFED-other 1	463 (7.52)	380 (11.12)	83 (3.03)	629 (12.07)	465 (15.20)	164 (7.61)
OSFED-other 2	394 (6.40)	240 (7.03)	154 (5.62)	830 (15.92)	656 (21.44)	174 (8.08)
ALL ED	1,166 (18.95)	844 (24.70)	322 (11.74)	1,922 (36.87)	1,515 (49.52)	407 (18.89)
ALL ED (excluding OSFED-other)	160 (5.03)	224 (6.55)	85 (3.09)	463 (9.13)	394 (12.88)	69 (3.20)

Note: AN = anorexia nervosa; BED = binge eating disorder; BN = bulimia nervosa; ED = eating disorder; OSFED = other specified feeding and eating disorder; PD = purging disorder.

Table 4

Prospective Associations Between Eating Disorder (ED) and Depression, Anxiety Disorders, Drug Use, Binge Drinking, and Self-Harm at the Following Wave

	Depression[a] (n=4,089)	**Anxiety Disorder[b] (n=4,787)**	**Drug Use[c] (n=3,845)**	**Binge Drinking[d] (n=3,148)**	**Deliberate Self-Harm[e] (n=4,468)**
AN	1.39* (1.00-1.94)	2.04* (1.09-3.82)	1.20 (0.63-2.28)	1.25 (0.81-1.91)	1.76 (0.92-3.34)
BN	3.39* (1.25-9.20)	7.13**** (3.08-16.48)	5.81*** (2.13-15.84)	1.74 (0.60-5.08)	5.72**** (2.22-14.72)
BED	2.00* (1.06-3.75)	3.53*** (1.58-7.86)	3.39*** (1.35-8.48)	1.41 (0.68-2.93)	1.38 (0.60-3.17)
PD	2.56*** (1.38-4.74)	3.73**** (1.79-7.79)	3.61*** (1.40-9.32)	1.59 (0.72-3.49)	4.88**** (2.78-8.57)
Sub-threshold BN	1.61 (0.57-4.54)	2.29*** (1.32-3.96)	5.90* (1.02-34.19)	0.89 (0.24-3.31)	3.97*** (1.44-10.98)
Sub-threshold BED	2.11**** (1.44-3.10)	7.90**** (2.53-24.67)	2.15* (1.14-4.04)	1.38 (0.88-2.16)	2.32*** (1.43-3.75)
OSFED-other 1	1.54**** (1.28-1.86)	2.06**** (1.49-2.83)	1.71*** (1.20-2.44)	1.09 (0.87-1.39)	2.04**** (1.54-2.70)
OSFED-other 2	1.37*** (1.13-1.66)	2.05**** (1.52-2.77)	1.49* (1.04-2.13)	1.17 (0.93-1.46)	1.70**** (1.30-2.22)
No ED	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)

Note: Data presented as adjusted odds ratios (ORs) and 95% CIs from generalized estimating equations (GEE) models, adjusted for wave of assessment, gender, maternal education, maternal parity in imputed datasets. AN = anorexia nervosa; BED = binge eating disorder; BN = bulimia nervosa; OSFED = other specified feeding and eating disorder; PD = purging disorder.

[a] Also adjusted for prior depression (between 7 and 13 years, and baseline).

[b] Also adjusted for prior depression (between 7 and 13 years, and baseline), prior anxiety disorder (between 7 and 13 years).

[c] Also adjusted for drug use at baseline.

[d] Also adjusted for smoking and alcohol use at baseline.

[e] Adjusted for prior depression (between 7 and 13 years).

* p≤.05

*** p≤.001

**** p≤.0001

Table 5

Prospective Associations Between Eating Disorders and Overweight/Obesity Compared to Normal Weight at Later Waves Amongst 3,801 Adolescents

	Overweight or Obesity
BN	3.43* (1.06-11.07)
BED	2.11 (0.98-4.58)
PD	2.15 (0.90-5.29)
Sub-threshold BN	0.84 (0.11-6.27)
Sub-threshold BED	1.70 (0.97-3.00)
OSFED 1	1.80**** (1.36-2.39)
OSFED 2	1.74**** (1.31-2.30)

Note: Data presented as odds ratios (ORs) and 95% CIs from generalized estimating equations (GEE) models, adjusted for body mass index (BMI) at 14, gender, maternal education, and maternal parity at enrollment. BED = binge eating disorder; BN = bulimia nervosa; OSFED = other specified feeding and eating disorders; PD = purging disorder.

* p≤.05

**** p≤.0001