



# Eating disorder symptoms among undergraduate and graduate students at 12 U.S. colleges and universities



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## ABSTRACT

**Objectives:** We sought to estimate the prevalence of eating disorder symptoms in a large sample of U.S. college students and variations therein across student characteristics.

**Methods:** Participants were 9713 students from 12 colleges and universities participating in the Healthy Bodies Study. We used gender-stratified logistic regression to estimate bivariate correlates of elevated eating disorder symptoms, past-month objective binge eating, and past-month compensatory behaviors across student characteristics including age, degree-level, sexual orientation, race/ethnicity, first-generation status, citizenship, academic and extracurricular characteristics, and weight status. Eating disorder outcomes were based on the Eating Disorder Examination Questionnaire.

**Results:** We observed higher prevalence of objective binge eating among females relative to males (49% versus 30%,  $p < 0.001$ ), but similar prevalence of compensatory behaviors (31% versus 29%). Weight status was the most consistent predictor of eating disorder risk with significantly more symptoms seen among individuals with overweight and obesity. When compared to individuals with a healthy weight, those with overweight had greater eating disorder risk (males OR = 3.5; females OR = 2.0), binge eating (males OR = 2.1; females OR = 1.9), and use of compensatory behaviors (males OR = 1.5; females OR = 1.3).

**Conclusions:** This study suggests smaller gender difference in prevalence of eating disorder symptoms than previously reported and identifies students with overweight/obesity as salient targets for campus-based eating disorder screening and early intervention efforts.

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## 1. Introduction

While symptoms of eating disorders (EDs) often emerge early in adolescence (Vohs, Heatherton, & Herrin, 2001; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011), the traditional undergraduate years directly coincide with median age of onset for eating disorders (Hudson, Hiripi, Pope, & Kessler, 2007). On campuses across the country, the prevalence of EDs appears high, with estimates ranging from 11% to 17% among female students (Hoerr, Bokram, Lugo, Bivins, & Keast, 2002; Eisenberg, Nicklett, Roeder, & Kirz, 2011; Prouty, Protinsky, & Canady, 2002) and prevalence of about 4% in males (Hoerr et al., 2002; Eisenberg et al., 2011). As such, colleges and universities present a unique opportunity for early intervention and prevention of EDs. Maximizing this opportunity requires nuanced understanding of risk factors and variations therein across individual characteristics. This knowledge is essential for the development and

tailoring of effective population-level strategies to address the high prevalence of EDs on campus.

Previous research has identified characteristics associated with elevated ED risk in college populations. Specifically, female (Hoerr et al., 2002; Eisenberg et al., 2011; Striegel-Moore, Silberstein, Frensch, & Rodin, 1989) and sexual minority students (Matthews-Ewald, Zullig, & Ward, 2014) are considered high-risk groups. While several studies have reported differences in ED risk across racial and ethnic identities (Eisenberg et al., 2011; Napolitano & Himes, 2011), no consistent patterns have emerged. Some research has examined prevalence among athletes (Chatterton & Petrie, 2013; DiPasquale & Petrie, 2013; Wollenberg, Shriver, & Gates, 2015; Engel, Johnson, Powers, et al., 2003; Greenleaf, Petrie, Carter, & Reel, 2009) and sorority women (Hoerr et al., 2002; Allison & Park, 2004) and these two sub-groups are often targeted in interventions (Becker et al., 2010; Becker, McDaniel, Bull, Powell, & McIntyre, 2012; Smith & Petrie, 2008). A small and limited body of research on ED risk according to academic major suggests elevated risk among students in health-related majors such as nutrition/dietetics and exercise science (Harris, Gee, D'Acquisto, Ogan, & Pritchett, 2015; Korinth, Schiess, & Westenhoefer, 2010).

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Overall, college students remain an understudied population with many unanswered questions and missed opportunities for prevention, early detection, and intervention. Extant studies have typically been conducted at a single campus, thereby limiting the generalizability of findings. Because the prevalence and correlates of ED symptomatology among college students remains poorly characterized from a public health (or population-level) perspective, large-scale, multi-site studies are needed to better characterize the risk profile of today's diverse college students. Accordingly, we sought to estimate the prevalence of ED symptoms among a large, diverse sample of undergraduate and graduate students at 12 U.S. colleges and universities that participated in the Healthy Bodies Study. We examined variations in prevalence across important student characteristics including age, degree-level, gender, sexual orientation, race/ethnicity, first-generation status, citizenship, academic and extracurricular characteristics, and weight status. The overall aim of the present study was to better characterize the ED risk profile of college students and identify opportunities for targeted prevention and intervention on college campuses.

## 2. Methods

### 2.1. Data

The Healthy Bodies Study (HBS) is a population-level, web-based survey (The healthy bodies study, 2013). We use aggregated HBS data from two academic years (2013–2014 and 2014–2015) with survey results from students at 12 colleges and universities across the country. HBS is administered to a randomly selected sample of undergraduate and graduate students at participating institutions. Each participating school provides the HBS team with a random sample of up to 4000 currently enrolled students who are at least 18 years of age. There are no other inclusion or exclusion criteria. Students are then invited and reminded to participate in the survey via emails. HBS was administered using Qualtrics' survey software and took students approximately 15 min to complete. All research was approved by the Institutional Review Boards at participating institutions. To further protect respondent privacy, the study is covered by a Certificate of Confidentiality from the National Institutes of Health.

### 2.2. Non-response analysis

HBS response rates were 19% in 2013–2014 and 27% in 2014–2015. Although students are randomly selected from a list of all currently enrolled students, a potential concern is that those who respond are not fully representative of the population from which they are drawn. To adjust for potential differences between survey responders and non-responders, we constructed sample probability weights. For students in the initial random samples, we obtained administrative data from participating institutions, including gender, academic level, race/ethnicity, and grade point average. We then constructed response weights, equal to 1 divided by the predicted probability of survey response, using a logistic regression to estimate the predicted probability of response based on these variables. Thus, weights are larger for respondents with underrepresented characteristics, ensuring that all estimates are representative of the full population in terms of basic demographic and other characteristics.

### 2.3. Outcomes

While full-syndrome EDs (anorexia nervosa, bulimia nervosa, and binge eating disorder) are conditions with specific combination of symptoms, students with full-syndrome conditions represent only a fraction of the students who are struggling with symptoms such as eating concern, weight or shape concern, dietary restraint, binge eating, and use of compensatory behaviors. Sub-threshold ED presentations, which are the foundation of many early detection efforts, may be

characterized by a single ED symptom or may involve various combinations of ED symptoms and are most suitable for early detection efforts. Accordingly, we separately examined three primary outcomes related to ED symptoms: (Vohs et al., 2001) elevated ED risk, (Swanson et al., 2011) objective binge eating, and (Hudson et al., 2007) compensatory behaviors. These outcomes were assessed in HBS using the validated and widely-used Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Beglin, 1994; Mond, Hay, Rodgers, Owen, & Beumont, 2004; Quick & Byrd-Bredbenner, 2013). Our three dependent variables, as described below, are operationalized as binary outcomes.

Elevated ED risk: The EDE-Q is made up of four subscales (Eating Concern, Shape Concern, Weight Concern, Dietary Restraint), as well as a global score, which is the average of the subscales. We defined elevated ED risk as a global EDE-Q score of  $\geq 3$ . While this cutoff is below what is generally considered a clinically positive EDE-Q screen ( $\geq 4$ ), a score of  $\geq 3$  is well above the average score among undergraduate men (0.87–0.95) (Rose, Vaewsorn, Rosselli-Navarra, Wilson, & Weissman, 2013) and women (1.74) (Luce, Crowther, & Pole, 2008) in the U.S. and allows us to identify at-risk students.

#### 2.3.1. Objective binge eating (OBE)

OBE was defined as a response of 1 or more times experiencing "a sense of having lost control over your eating (at the time that you were eating)" in the past four weeks.

#### 2.3.2. Compensatory behaviors (CB)

Use of compensatory behaviors was defined as a response of one or more times making "yourself sick (vomit) as a means of controlling your shape or weight", taking "laxatives as a means of controlling your shape or weight", taking "diuretics (water pills) or diet pills as a means of controlling your shape or weight", and/or exercising "in a "driven" or "compulsive" way as a means of controlling your weight, shape or amount of fat, or to burn off calories" in the past four weeks.

### 2.4. Covariates

We examine variations in ED symptoms across important student characteristics. Specifically, our analyses (as described below) account for 10 covariates: (Vohs et al., 2001) age (dummy variables for 18–20, 21–23, 24–27, and  $\geq 28$ ); (Swanson et al., 2011) degree-level (undergraduate versus graduate student); (Hudson et al., 2007) sexual orientation (heterosexual versus sexual minority defined as students who identified as bisexual, gay or lesbian, questioning, or other sexuality); (Hoerr et al., 2002) race/ethnicity (dummy variables for Latino/a, White, African American, Asian, and other race/ethnicity); (Eisenberg et al., 2011) first-generation status (as a proxy for socioeconomic status) (non-first-generation (if at least one parent has a bachelor's degree) versus first-generation (neither parent has a bachelor's degree)); (Prouty et al., 2002) citizenship (U.S. citizen versus international student); (Striegel-Moore et al., 1989) academic major (dummy variables for humanities, natural sciences, social sciences, art, business, engineering, law, medicine, pre-professional, social work, undecided, and other major); (Matthews-Ewald et al., 2014) athlete status; (Napolitano & Himes, 2011) housing (dummy variables for on-campus, fraternity/sorority, off-campus, and other housing); and (Chatterton & Petrie, 2013) weight status (dummy variables for underweight (BMI (body mass index)  $< 18.5$ ), healthy weight (BMI = 18.5–24.9), overweight (BMI = 25.0–29.9), and obese (BMI  $> 30.0$ )).

### 2.5. Statistical analysis

Using bivariate analyses stratified by gender, we estimate variations in ED symptoms, reporting percentages of the weighted sample meeting criteria for each of the three binary outcomes. Specifically, we examine variations across the covariates listed above, reporting odds ratios from logistic regressions (see Table 2). For each outcome, we estimate

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