

## ORIGINAL ARTICLE

# Weight teasing experienced during adolescence and young adulthood: Cross-sectional and longitudinal associations with disordered eating behaviors in an ethnically/racially and socioeconomically diverse sample

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## Abstract

**Objective:** This study assessed cross-sectional and longitudinal relationships between weight teasing and disordered eating in an ethnically/racially and socioeconomically diverse sample of young people and examined these relationships across sociodemographic characteristics.

**Method:** The EAT 2010–2018 study surveyed adolescents ( $n = 1,534$ ) in the Minneapolis/St. Paul public schools (mean age = 14.4 years) and 8 years later (mean age = 22.2 years).

**Results:** Weight teasing was prevalent in adolescence (34.1%) and young adulthood (41.5%). In analyses adjusted for sociodemographic characteristics and body mass index, weight teasing was cross-sectionally associated with a higher prevalence of all disordered eating behaviors during both adolescence and young adulthood. For example, 64.5% of young adults who reported being teased about their weight engaged in unhealthy weight control behaviors, compared with 47.9% among those not teased ( $p < .001$ ). There were fewer observed associations in longitudinal analyses, although weight teasing still predicted prevalent overeating and both prevalent and incident dieting (incident dieting—teased: 48.4% vs. not teased: 38.0%,  $p = .016$ ). Weight teasing and disordered eating were more prevalent among Black, Indigenous, and People of Color (BIPOC) young people and those from low socioeconomic backgrounds, and the relationship between weight teasing and disordered eating was similar across ethnic/racial, socioeconomic, and gender demographic groups.

**Discussion:** Results indicate that weight teasing is strongly correlated with disordered eating in both adolescence and young adulthood regardless of ethnicity/race, socioeconomic status, or gender. Findings suggest that future research and policy interventions should address weight stigma and prioritize the needs of BIPOC young people and young people from low socioeconomic backgrounds.

## KEYWORDS

adolescent, bias, eating behavior, eating disorders, health disparities, preventive medicine, weight teasing, young adult

## 1 | INTRODUCTION

### 1.1 | Weight stigma and disordered eating in adolescence and young adulthood

Weight stigma involves the social devaluation of people due to their high body weight or body size. It may stem from unfounded stereotypes that individuals with higher weight lack willpower or discipline, are lazy, or are unmotivated, and can be both structurally and interpersonally mediated (Pearl, 2018). The transition from adolescence to young adulthood is a critical period of development during which prevention and intervention efforts may decrease health threats and alter health trajectories for the adult population (Stroud, Walker, Davis, & Irwin, 2015). Forming social relationships is an important part of healthy psychosocial development during this transition, thus peer rejection may be especially potent (Puhl & Latner, 2007; Stroud et al., 2015). Exposure to weight stigma during adolescence and young adulthood is associated with poor psychosocial health outcomes including higher depressive symptoms (Bucchianeri, Eisenberg, Wall, Piran, & Neumark-Sztainer, 2014; Greenleaf, Petrie, & Martin, 2014; levers-Landis, Dykstra, Uli, & O'riordan, 2019), substance use (Puhl, Himmelstein, & Watson, 2019), body dissatisfaction (Bucchianeri et al., 2014; Vartanian & Shaprow, 2008), self-harm (Bucchianeri et al., 2014), social isolation (Carr & Friedman, 2006), school avoidance (Puhl & Luedicke, 2012), and lower self-esteem (Bucchianeri et al., 2014; Friedman et al., 2005; Greenleaf et al., 2014; Myers & Rosen, 1999). Studies have also examined the relationship between weight stigma and body mass index, and longitudinal evidence indicates that weight stigma experienced in adolescence predicts increases in body mass index (Haines, Neumark-Sztainer, Wall, & Story, 2007; Puhl, Chen, Bryn Austin, Eisenberg, & Neumark-Sztainer, 2017; Quick, Wall, Larson, Haines, & Neumark-Sztainer, 2013).

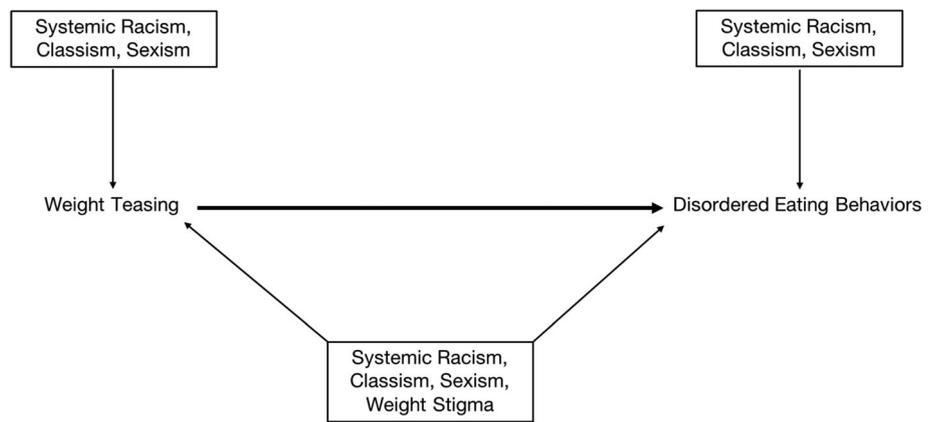
For young people, the experience of weight stigma is common, with U.S. studies estimating prevalence at 23–32% (Bucchianeri, Gower, McMorris, & Eisenberg, 2016; Juvonen, Lessard, Schacter, & Suchilt, 2017). A recent meta-analysis determined that while some studies have found that weight stigma is more prevalent among female participants, others have found no gender differences (Emmer, Bosnjak, & Mata, 2020). Questions exist about the prevalence and impact of weight stigma in Black, Indigenous, and People of Color (BIPOC) young people and those from low socioeconomic backgrounds (Emmer et al., 2020). Several studies have found no difference in weight stigma prevalence across ethnicity/race (Himmelstein, Puhl, & Quinn, 2017; Van Den Berg, Neumark-Sztainer, Eisenberg, & Haines, 2008) while other work has found that weight teasing by family members is more prevalent among BIPOC adolescents when

compared with white adolescents (Eisenberg, Puhl, Areba, & Neumark-Sztainer, 2019).

Disordered eating behaviors (DEBs) include binge eating, food restriction, and purging behaviors (e.g., vomiting or laxative use) to control one's body shape or size (Nagata, Garber, Tabler, Murray, & Bibbins-Domingo, 2018). DEBs are associated with a higher risk for adverse health outcomes, even when a young person does not meet the full criteria for a clinical eating disorder (e.g., bulimia nervosa) (Goldschmidt et al., 2018; Striegel-Moore & Bulik, 2007; Thein-Nissenbaum, Rauh, Carr, Loud, & Mcguine, 2011). DEBs are a prevalent problem among young people across demographic groups. For example, while they are more prevalent in girls and women (58.8% in adolescents, 54.8% in young adults), they remain a highly prevalent problem for boys and men (31.7% in adolescents, 32.6% in young adults) (Neumark-Sztainer et al., 2018). Population-based studies have demonstrated that DEBs are more prevalent among BIPOC youth when compared to white youth (Beccia et al., 2019; Neumark-Sztainer et al., 2002; Rodgers, Berry, & Franko, 2018; Rodgers, Watts, Austin, Haines, & Neumark-Sztainer, 2017), and more prevalent among youth from low versus high socioeconomic status (SES) backgrounds (Nagata et al., 2018). Despite these findings, assumptions persist that DEBs primarily affect young people who are affluent and white, and these assumptions may contribute to health inequities, such as barriers to identification and treatment of clinical eating disorders (Sonneville & Lipson, 2018). Thus a health equity framework, which seeks to improve the health of the entire population by reducing health disparities in underserved populations, may be useful to understand how to prevent and address DEBs in young people, especially in populations already at risk for myriad nutrition- and weight-related health disparities (Greves Grow et al., 2010; Spanakis & Golden, 2013; Trinh-Shevrin, Islam, Nadkarni, Park, & Kwon, 2015). A health equity framework acknowledges and attempts to address the fact that health research participants and investigators are often part of the majority population (e.g., largely white and middle class), and therefore the conclusions drawn from research and corresponding interventions developed may miss key elements relevant to meeting the health needs of vulnerable populations (Trinh-Shevrin et al., 2015).

Previous research investigating the relationship between experiencing weight stigma and DEBs in young people has found that exposure to weight stigma is associated with a higher prevalence of DEBs both cross-sectionally (Eisenberg et al., 2019; Najjar, Jacob, & Evangelista, 2018; Sutin, Stephan, Robinson, Daly, & Terracciano, 2020) and longitudinally (Haines, Neumark-Sztainer, Eisenberg, & Hannan, 2006; Hunger & Tomiyama, 2018; Puhl et al., 2017). Studies examining whether this relationship varies by demographic characteristics in young people have yielded mixed

**FIGURE 1** Directed Acyclic Graph for hypothesized relationship between weight teasing and disordered eating behaviors. Measures of ethnicity/race, socioeconomic status, gender, and body mass index are used in statistical models as imperfect proxies for exposure to the systemic forms of racism, classism, sexism, and weight stigma, respectively



results by gender (Eisenberg et al., 2019; Emmer et al., 2020; Haines et al., 2006; Puhl et al., 2017; Sutin et al., 2020) and no differences across ethnicity/race (Eisenberg et al., 2019; Emmer et al., 2020; Hunger & Tomiyama, 2018). One study examined differences by SES and found that family weight teasing during adolescence was a risk factor for binge eating 5 years later in the higher SES group but found no association in the lower SES group (West, Goldschmidt, Mason, & Neumark-Sztainer, 2019).

## 1.2 | Shortcomings of existing research on associations

Importantly, existing literature has established that the weight stigma-DEB relationship exists among BIPOC youth and young people from low SES backgrounds (Eisenberg et al., 2019; Hunger & Tomiyama, 2018; Najjar et al., 2018) and that exposure to weight stigma precedes DEBs (Haines et al., 2006; Hunger & Tomiyama, 2018; Puhl et al., 2017). However, to our knowledge, no single study has included both of these elements: a longitudinal study design and a sample statistically powered to detect differences by ethnicity/race and SES. As our study sample is large, has longitudinal data, and participants are ethnically/racially diverse and largely from low SES backgrounds, it provides an opportunity to use a health equity framework to deepen the understanding of the weight stigma-DEB relationship and help clarify where health inequities exist for young people.

## 1.3 | The current study

For young people, weight stigma often occurs in the form of weight teasing (Puhl & Latner, 2007). In this study, we examine associations between weight teasing and DEBs in adolescents and young adults, both cross-sectionally and longitudinally, and aim to assess possible effect modification in an ethnically/racially diverse, primarily lower SES cohort. Specifically, we test the following hypotheses. First, we hypothesize that exposure to weight teasing will be cross-sectionally associated with DEBs at both time points (in adolescence and young

adulthood) and longitudinally associated with incident and prevalent DEBs 8 years later (from adolescence to young adulthood). Second, we expect that health disparities will present in our sample. Specifically, we hypothesize that the prevalence of both weight teasing and DEBs will be higher in BIPOC young people, young people from low SES backgrounds, and female participants, when compared with white, higher SES, and male participants, respectively (see Figure 1 for the hypothesized relationship of study variables). Third, we will explore whether ethnicity/race, SES, and gender are effect modifiers in the relationship between weight teasing and DEBs. Given the mixed literature on this topic, this research question is exploratory with no a priori hypothesis.

Examining these understudied questions can expand the current understanding of the weight teasing-DEB relationship among underserved populations of young people. Our cross-sectional analyses allow for examining associations at one point in time, while our longitudinal analyses allow for a determination of temporality. Furthermore, this study can help clarify whether and how health inequities related to weight teasing and disordered eating occur, which can inform current knowledge of weight teasing as a universal risk factor for disordered eating. Findings will provide insights for future studies seeking to target the overall population-level distribution of disordered eating with attention to the needs of young people from low SES backgrounds and those of BIPOC young people.

## 2 | METHOD

### 2.1 | Study design and participants

Data were collected as a part of EAT 2010–2018 (Eating and Activity over Time), a population-based, longitudinal study designed to examine dietary intake, physical activity, weight control behaviors, weight status, and factors associated with these outcomes in young people (Larson, Wall, Story, & Neumark-Sztainer, 2013). Participants enrolled in the EAT 2010 study as adolescents during the 2009–2010 academic year (mean age = 14.4 ± 2.0 years) and completed a follow-up EAT 2018 survey online or via mail as young adults in 2017–2018 (mean age = 22.2 ± 2.0 years). The study population was largely low

SES and ethnically/racially diverse. In the analytic sample, distribution by ethnicity/race was 28.6% African American or Black, 20.0% Asian American, 19.1% white, 17.2% Latinx or Hispanic, and 15.2% mixed or other. Distribution across socioeconomic status was 39.5% low, 22.2% low middle, 17.6% middle, 13.2% upper-middle, 7.5% high. At baseline, 46.3% of participants identified as male and 53.7% as female.

The EAT 2010 study population included adolescents from 20 public middle and high schools in Minneapolis/St. Paul, Minnesota. Adolescents completed classroom surveys and anthropometric measures at school (Neumark-Sztainer et al., 2012). The follow-up EAT 2018 assessment was designed to examine changes in weight-related outcomes as participants progressed through adolescence and into young adulthood. This time frame allowed the youngest participants from EAT 2010 to move onto their next stage of development by the time of the EAT 2018 assessment. To be included in the analytic sample, ( $n = 1,534$ ), participants needed to have completed both surveys including the weight teasing item (see Figure 2). The University of Minnesota's Institutional Review Board Human Subjects Committee approved all study protocols.

## 2.2 | Survey development

The EAT 2010 survey, a 235-item self-report instrument, assessed test-retest reliability of measure and internal consistency of survey items in a separate sample of 129 middle and high school students over a one-week period (Neumark-Sztainer et al., 2012). Key items from the EAT 2010 survey were retained on the EAT 2018 survey,

allowing for longitudinal comparisons (Larson et al., 2013). All survey items were selected after a thorough review of the literature, including items used to assess similar behaviors in other large population-based studies of adolescents and young adults, thus the use of these items allows for comparisons with other studies. The choice of items was based on focus group discussions with young people from diverse backgrounds at different stages of survey development, in addition to multiple reviews by content experts (e.g., in the fields of adolescent health, eating disorders, nutrition, psychology, and physical activity). In addition, the psychometric properties of these survey items have been tested (Neumark-Sztainer et al., 2002). For EAT 2018, test-retest reliability measures were assessed in a subgroup of 112 young adult participants over a 3-week period.

## 2.3 | Primary measures

### 2.3.1 | Weight teasing

Weight teasing was assessed at baseline and follow-up using the question, "How often do any of the following things happen? .... You are teased about your weight." Responses included "never, less than once a year, a few times a year, a few times a month, and at least once a week" (Neumark-Sztainer, Wall, Story, & Perry, 2003). This variable was dichotomized with "never" coded "no" and all other response options coded "yes" (test-retest agreement = 85%). Dichotomous coding was used because previous studies in young people have shown that reports of ever experiencing weight teasing (vs. never) are predictive of adverse health outcomes (Bucchianeri et al., 2014; Eisenberg et al., 2019; Puhl et al., 2017).

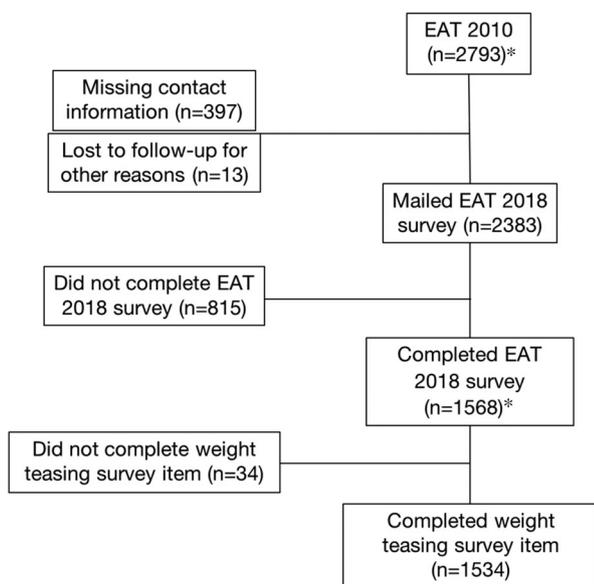
### 2.3.2 | Dieting

Dieting was assessed by asking, "How often have you gone on a diet during the last year? By 'diet' we mean changing the way you eat so you can lose weight." Responses included "never, 1-4 times, 5-10 times, more than 10 times, I am always dieting." Two variables, "dieting," and "chronic dieting" were derived from this item, and both outcomes were dichotomized. "Dieting" was defined as dieting one or more times in the past year versus never. "Chronic dieting" was defined as dieting five or more times in the past year versus four or fewer times in the past year. (Neumark-Sztainer et al., 2002, 2003). Test-retest agreement was 82%.

### 2.3.3 | Unhealthy weight control behaviors

To assess unhealthy weight control behaviors (UWCB), participants were asked, "Have you done any of the following things in order to lose weight or keep from gaining weight during the past year?" Responses included "fasted, ate very little food, used a food substitute, skipped meals, smoked more cigarettes, took diet pills, made

Excluded from Analytic Sample:      Included in Analytic Sample:



**FIGURE 2** Flow diagram demonstrating how participants were selected into the analytic sample from the original EAT 2010 study sample. \* Participants completing at least 25% of survey items were considered completers

myself vomit, used laxatives, and used diuretics.” Of these items, the following were further categorized as extreme weight control behaviors (EWCB): “took diet pills, made myself vomit, used laxatives, and used diuretics.” (Neumark-Sztainer et al., 2002, 2003). Responses were dichotomized with a positive response for one or more behaviors coded as “yes,” and no positive responses coded as “no” (test-retest agreement = 85% for UWCB, 96% for EWCB).

### 2.3.4 | Overeating and binge eating

Two questions adapted from the adult version of the Questionnaire on Eating and Weight Patterns-Revised assessed overeating and binge eating (Yanovski, 1993), which has demonstrated good psychometric properties in adolescent samples (Johnson, Grieve, Adams, & Sandy, 1999). To assess overeating, participants were asked, “In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you (binge-eating)?” Among those who answered yes, binge eating was assessed by asking, “During the times when you ate this way, did you feel you couldn't stop eating or control what or how much you were eating?” (test-retest agreement = 89% for overeating, 75% for binge eating). We were interested in overeating as an outcome because of the cardiometabolic health risks associated with this eating pattern (Goldschmidt, 2017).

## 2.4 | Sociodemographic measures

### 2.4.1 | Age

Birthdate was self-reported by adolescents. Age at both time points was derived from birthdate and the survey completion date.

### 2.4.2 | Gender/sex

Gender/sex was assessed at baseline with two response options: “male” or “female.” At follow-up, “different identity” with a written response option was additionally offered. There were too few participants who responded with a different identity ( $n = 11$ ) to conduct valid statistical analysis using this categorization, and we did not want to exclude these participants. Therefore, we categorized participants based on baseline responses. For simplicity, throughout the remainder of this article, gender/sex will be referred to as “gender.”

### 2.4.3 | Socioeconomic status

Classification tree methodology generated five categories of SES (Brieman, Friedman, Olshen, & Stone, 1984; Neumark-Sztainer et al., 2002); details are described in Supporting Information. Baseline SES was used for all analyses because SES during childhood and

adolescence is known as a good predictor of health outcomes during adulthood regardless of adult experiences (Montez & Hayward, 2014).

### 2.4.4 | Ethnicity/race

Ethnicity/race was assessed with the following question: “Do you think of yourself as...? (You may choose more than one) (1) White, (2) Black or African American, (3) Hispanic or Latino, (4) Asian American, (5) Native Hawaiian or Pacific Islander, (6) American Indian or Native American, or (7) Other” (test-retest agreement = 98–100%). If a participant responded “Other” in addition to reporting another ethnicity/race, they were categorized as “Other.” Due to small numbers, Native Hawaiian or Pacific Islander, American Indian or Native American, and Other were coded together as “Mixed or Other Race” (Neumark-Sztainer et al., 2002, 2012).

### 2.4.5 | Body mass index

At baseline, adolescent weight and height were measured by trained staff in a private area, using standardized procedures. Body mass index (BMI) at follow-up was based on self-reported height and weight, which highly correlate with measured height and weight in adolescents ( $r = .88$  for boys and  $.85$  for girls) (Himes, Hannan, Wall, & Neumark-Sztainer, 2005). BMI percentile at baseline and BMI at follow-up were derived from weight and height using the Centers for Disease Control and Prevention guidelines (Kuczmarski et al., 2000).

## 2.5 | Statistical analysis

Chi-square tests assessed frequencies and percentages of ethnicity/race, baseline SES, and gender by weight teasing status. *t*-tests assessed the mean and *SD* of age and BMI by weight teasing status. To achieve the primary objective of this study, unadjusted associations (probabilities and frequencies) between weight teasing and DEBs (dieting, chronic dieting, UWCB, EWCB, overeating, and binge eating), were examined using chi-square tests. Logistic regression models, adjusted for ethnicity/race, baseline SES, gender, and BMI/BMI percentile, examined the relationship between weight teasing and DEBs and estimated marginal probabilities and 95% confidence intervals. Adjusted models used Huber-White robust sandwich estimators to adjust for potential clustering by school status at baseline. Both chi-square tests and logistic regression analyses were used for cross-sectional analyses at baseline, cross-sectional analyses at follow-up, and longitudinal analyses (incidence and prevalence). Analyses were run with and without adjustment for BMI. In both sets of analyses, point estimates were approximately the same and the direction of the association did not change. However, some outcomes were de-attenuated when BMI was removed from the models. We opted to keep BMI in the model as it represents an imperfect proxy for societal weight stigma and therefore, we consider it a confounding

variable. See Figure 1 for our directed acyclic graph (DAG), a visual representation of variables used in statistical models which serves as an aid in the scientific discussion about causal inference in the field of epidemiology. DAGs help identify the presence of confounders, variables which are associated with both predictor and outcome variables but are not in the causal pathway (Rothman, Lash, & Greenland, 2008; Suttrop, Siegerink, Jager, Zoccali, & Dekker, 2015). Post hoc analyses were conducted in all models to assess whether the odds of DEBs were higher in participants who were teased more frequently.

To assess whether the prevalence of weight teasing and DEBs differed by ethnicity/race (BIPOC vs. white), baseline SES (lowest SES vs. higher SES categories), or gender (female vs. male), chi-square tests were conducted at baseline and follow-up. To examine whether the relationship between weight teasing and DEBs varied by ethnicity/race, baseline SES, or gender, interaction terms between sociodemographic variables and weight teasing were added to fully-adjusted logistic regression models. Separate models were fit for each sociodemographic characteristic (a model with an interaction term for ethnicity/race, a model with an interaction term for gender, etc.). Dichotomous comparisons were used for the prevalence estimates and interaction terms using the measures of ethnicity/race, baseline SES, and gender as proxies for exposure to the systemic forms of racism, classism, and sexism, respectively. Such measures are imperfect proxies for systemic oppression, given the considerable heterogeneity of experiences within these groups and the inability to capture the complexity of such oppression through simple categorization of demographic characteristics.

Because attrition did not occur completely at random, inverse probability weighting (IPW) was used for all analyses to account for missing data (Little, 1986; Seaman & White, 2013). IPW minimizes potential response bias due to missing data and allows for extrapolation back to the original EAT 2010 sample. The probability of responding to the 2018 survey was calculated using logistic regression of yes/no responder status predicted by baseline 2010 survey variables: age, gender, U.S. born, race, ethnicity, SES, dieting, BMI, and an indicator of obesity status. The 25th and 75th percentile of the weights (inverse of the probability of responding rescaled to have mean 1) ranged from 0.81 to 1.10. Because there were no extreme weights (minimum = 0.606, maximum = 2.914) there was no need for trimming the weights, and they are used in all analyses. All analyses were conducted using SAS 9.4 (Cary, NC, copyright 2002–2012).

### 3 | RESULTS

#### 3.1 | Sociodemographic characteristics

Weight teasing was prevalent in the sample with 34% of participants teased about their weight during adolescence and 42% during young adulthood (Table 1). At both baseline and follow-up, higher BMI/BMI percentile was associated with a higher prevalence of weight teasing ( $p < .001$ ). Ethnicity/race was also associated with weight teasing status ( $p = .036$  at baseline,  $p < .001$  at follow-up) with Asian American

participants experiencing the highest prevalence of weight teasing (41.3% at baseline, 52.6% at follow-up). At baseline but not follow-up, lower SES ( $p = 0.011$ ) and female gender ( $p = 0.029$ ) were associated with a higher prevalence of weight teasing. There were no observed differences in weight teasing by age.

#### 3.2 | Cross-sectional findings during adolescence and young adulthood

At baseline and follow-up, for every DEB (dieting, chronic dieting, UWCB, EWCB, overeating, and binge eating), the prevalence was higher in participants who experienced weight teasing when compared to those with no weight teasing (Table 2). For example, EAT 2010 adjusted analyses showed that 12.3% (95% CI: 9.2–16.2%) of adolescents who were teased about their weight engaged in binge eating, compared with 4.3% (95% CI: 3.1–6.0%) among those not teased. EAT 2018 adjusted analyses showed that 64.5% (95% CI: 60.7–68.1%) of young adults teased about their weight engaged in UWCB, compared with 47.9% (95% CI: 44.0–51.8%) among those not teased.

#### 3.3 | Longitudinal findings and graded relationship between weight teasing and disordered eating

In the longitudinal adjusted analyses, weight teasing was associated with a higher incidence of dieting and a higher prevalence of both dieting and overeating (Table 3). For example, new-onset dieting was higher in young adults who had experienced weight teasing during adolescence (48.4%, 95% CI: 41.5–55.2%) when compared with those who had not been teased (38.0%, 95% CI: 34.7–41.3%). For all cross-sectional and longitudinal main effects models, post hoc analyses reveal that the odds of DEBs were higher amongst participants experiencing more frequent weight teasing (see Supporting Information, Tables A and B).

#### 3.4 | Weight teasing and disordered eating across demographic groups

The prevalence of weight teasing and all DEBs except overeating during young adulthood, was higher among BIPOC participants when compared with white participants, with statistically significant differences in weight teasing during young adulthood; dieting, chronic dieting, and UWCB at both time points; and EWCB during adolescence (Tables 4 and 5). The same trend was true for baseline SES and gender. For weight teasing and all DEBs except chronic dieting and overeating during young adulthood, the prevalence was higher in participants from low SES backgrounds than higher SES backgrounds with statistically significant differences in weight teasing and dieting during adolescence, UWCB at both time points, and EWCB during young adulthood. Weight teasing and all DEBs were higher in female

**TABLE 1** Sociodemographic characteristics and body mass index among young people in Minneapolis-St Paul, Minnesota by weight teasing status at baseline (EAT 2010) and eight-year follow up (EAT 2018), unadjusted estimates

Characteristics	Total mean ± SD or % (n)	Adolescence (EAT 2010)			Young adulthood (EAT 2018)		
		Not teased mean ± SD or % (n)	Teased mean ± SD or % (n)	p-value	Not teased mean ± SD or % (n)	Teased mean ± SD or % (n)	p-value
Total	1,534	65.9 (1010)	34.1 (523)	n/a	58.5 (871)	41.5 (618)	n/a
Ethnicity / race (%)				<b>.036</b>			<b>&lt;.001</b>
Black or African American	28.6 (437)	69.7 (304)	30.3 (132)		61.4 (258)	38.6 (162)	
Asian American	20.0 (306)	58.7 (180)	41.3 (126)		47.4 (142)	52.6 (158)	
White	19.1 (292)	67.6 (197)	32.4 (94)		67.6 (194)	32.4 (93)	
Latinx or Hispanic	17.2 (263)	65.4 (172)	34.6 (91)		55.3 (138)	44.7 (112)	
Mixed or other race	15.2 (232)	66.4 (154)	33.6 (78)		59.9 (135)	40.2 (91)	
Socioeconomic status (%)				<b>.011</b>			<b>.133</b>
Low	39.5 (588)	61.1 (360)	38.9 (229)		55.3 (315)	44.7 (254)	
Low middle	22.2 (331)	65.5 (217)	34.5 (114)		57.7 (188)	42.3 (138)	
Middle	17.6 (262)	70.5 (185)	29.5 (77)		62.0 (155)	38.1 (95)	
Upper middle	13.2 (196)	69.5 (136)	30.5 (60)		59.5 (113)	40.5 (77)	
High	7.5 (112)	74.3 (83)	25.7 (29)		67.1 (74)	32.9 (36)	
Gender (%)				<b>.029</b>			<b>.383</b>
Female	53.7 (823)	63.4 (522)	36.6 (301)		57.5 (459)	42.6 (340)	
Male	46.3 (711)	68.7 (488)	31.3 (222)		59.7 (412)	40.3 (278)	
Age (mean years)	14.4 ± 2.0 <sup>a</sup> 22.2 ± 2.0 <sup>b</sup>	14.4 ± 2.0	14.5 ± 2.0	.139	22.1 ± 2.0	22.2 ± 2.0	.876
BMI (mean percentile or mean kg/m <sup>2</sup> ) <sup>c</sup>	69.2 ± 27.8 <sup>a</sup> 27.2 ± 7.0 <sup>b</sup>	66.3 ± 26.9	75.0 ± 28.6	<b>&lt;.001</b>	25.8 ± 5.9	29.1 ± 7.6	<b>&lt;.001</b>

Note: p-values bolded if statistically significant at the 0.05 significance level.

Abbreviation: BMI, body mass index.

<sup>a</sup>Assessed at baseline (EAT 2010).

<sup>b</sup>Assessed at follow up (EAT 2018).

<sup>c</sup>Mean BMI percentile is reported for adolescence, and mean BMI (raw value) is listed for young adulthood.

compared with male participants with statistically significant differences in all measures except weight teasing during young adulthood and chronic dieting at both time points. When interaction terms were added to statistical models, there was no evidence that the relationship between weight teasing and DEBs varied by ethnicity/race, baseline SES, or gender.

## 4 | DISCUSSION

In a primarily lower SES, ethnically/racially diverse population-based sample of young people, the experience of weight teasing was common. Weight teasing predicted a higher prevalence of DEBs, including dieting, chronic dieting, UWCB, EWCB, overeating, and binge eating, although the prevalence of DEBs was high in all participants,

regardless of whether they had been teased about their weight. These associations were statistically significant in the fully adjusted cross-sectional models during both adolescence and young adulthood. There were fewer observed associations in the longitudinal analyses, although weight teasing during adolescence significantly predicted prevalent overeating and both incident and prevalent dieting 8 years later. Both weight teasing and DEBs were more prevalent among BIPOC young people compared with white young people, among low SES young people compared with higher SES young people, and among female compared to male participants. In this sample, the relationship between weight teasing and DEBs did not vary by ethnicity/race, SES, or gender.

These findings are consistent with our hypotheses and align with previous studies, indicating that the experience of weight stigma predicts engagement in DEBs in young people both cross-sectionally

**TABLE 2** Cross-sectional relationships of disordered eating behaviors by weight teasing status: unadjusted percent and predicted prevalence at baseline (EAT 2010, adolescents) and at follow-up (EAT 2018, young adults)

Adolescence (EAT 2010)						
Outcome	Unadjusted percent (n)		p-value	Predicted prevalence (95% CI)		p-value
	Not teased	Teased		Not teased	Teased	
Dieting	31.2 (314)	55.5 (291)	<.001	29.0 (25.4, 33.0)	46.9 (41.5, 52.2)	<.001
Chronic dieting	7.3 (73)	16.2 (85)	<.001	5.5 (3.9, 7.7)	10.3 (7.0, 14.9)	<.001
UWCB	35.9 (360)	58.4 (305)	<.001	35.9 (32.7, 39.2)	53.5 (47.2, 59.7)	<.001
EWCB	2.6 (26)	7.4 (39)	<.001	2.2 (1.3, 3.7)	5.9 (4.3, 8.0)	<.001
Overeating	8.1 (81)	23.3 (120)	<.001	7.6 (6.0, 9.4)	20.0 (15.5, 25.4)	<.001
Binge eating	4.7 (47)	14.2 (73)	<.001	4.3 (3.1, 6.0)	12.3 (9.2, 16.2)	<.001
Young adulthood (EAT 2018)						
Outcome	Unadjusted percent (n)		p-value	Predicted prevalence (95% CI)		p-value
	Not teased	Teased		Not teased	Teased	
Dieting	44.2 (383)	66.8 (407)	<.001	48.9 (45.5, 52.3)	64.0 (60.0, 67.9)	<.001
Chronic dieting	9.4 (81)	16.0 (98)	<.001	9.3 (7.7, 11.1)	14.5 (12.0, 17.4)	<.001
UWCB	43.3 (372)	66.5 (398)	<.001	47.9 (44.0, 51.8)	64.5 (60.7, 68.1)	<.001
EWCB	7.3 (62)	20.8 (125)	<.001	6.7 (5.4, 8.3)	16.9 (13.8, 20.6)	<.001
Overeating	14.5 (125)	29.0 (175)	<.001	14.4 (12.8, 16.1)	26.0 (22.6, 29.7)	<.001
Binge eating	7.4 (64)	18.5 (111)	<.001	7.1 (5.5, 8.5)	15.3 (12.7, 18.2)	<.001

Note: Chi-square tests were used to estimate unadjusted percents. Logistic regression models were used to estimate predicted prevalence and 95% confidence intervals for each outcome variable. Predicted prevalence analyses adjusted for ethnicity/race, socioeconomic status, gender, body mass index (or body mass index percentile for EAT 2010 analyses), and clustering by baseline school status. Weighted analyses. *p*-values bolded if statistically significant at the 0.05 significance level.

Abbreviations: EWCB, extreme weight control behaviors; UWCB, unhealthy weight control behaviors.

(Eisenberg et al., 2019; Najjar et al., 2018; Sutin et al., 2020) and longitudinally (Haines et al., 2006; Hunger & Tomiyama, 2018; Puhl et al., 2017). For example, in a cohort of 14-year-old African-American and white girls ( $n = 4,036$ ), being labeled “fat” by family members was associated with more disordered eating 5 years later and these findings did not vary by race (Hunger & Tomiyama, 2018). Our study adds to this longitudinal evidence and suggests that the relationship between weight teasing and DEBs does not differ by gender, which aligns with some previous findings (Eisenberg et al., 2019; Emmer et al., 2020) but not others (Haines et al., 2006; Puhl et al., 2017; Sutin et al., 2020). Overall, our findings indicate that weight teasing may be harmful to young people regardless of sociodemographic characteristics.

For many years, it was thought that weight teasing might be less harmful to the well-being of BIPOC youth when compared with white youth because of cultural differences in the meaning and intensity of weight teasing (Thompson, Altabe, & Tantleff-Dunn, 2004). Moreover, a previous study by our research team in a cohort who were adolescents in the late 1990s found that girls who identified as Black, Asian-American, and Mixed/other race were less likely to be bothered by family-based weight teasing in comparison to white girls (Van Den Berg et al., 2008). However, our data suggest that weight teasing may have deleterious effects on young people's health regardless of sociodemographic characteristics. One explanation for these findings is that generational changes have occurred since the late 1990s, and factors which link weight teasing to DEBs (e.g., body dissatisfaction)

**TABLE 3** Longitudinal relationships of disordered eating behaviors at 8-year follow-up by weight teasing status at baseline: unadjusted and adjusted estimates, restricted to participants without the outcome at baseline (Incidence) and full sample (Predicted Prevalence)

Incidence—sample restricted to participants without the outcome at baseline							
Outcome	Total <sup>a</sup>	Unadjusted estimates % (n)		p-value	Adjusted estimates % (95% CI)		p-value
		Not teased	Teased		Not teased	Teased	
Dieting	918	38.5 (264)	50.7 (118)	<b>.001</b>	38.0 (34.7, 41.3)	48.4 (41.5, 55.2)	<b>.016</b>
Chronic dieting	1,361	9.6 (89)	12.3 (54)	.130	8.9 (7.2, 11.0)	10.1 (7.1, 14.1)	.579
UWCB	840	29.8 (249)	49.2 (105)	<b>.016</b>	40.1 (36.5, 43.7)	45.9 (37.0, 55.0)	.243
EWCB	1,439	10.3 (99)	15.7 (75)	<b>.003</b>	9.4 (7.6, 11.5)	11.6 (8.4, 15.9)	.264
Overeating	1,298	16.4 (149)	20.4 (79)	.081	15.8 (13.6, 18.4)	16.5 (12.9, 21.0)	.681
Binge eating	1,371	9.4 (88)	13.4 (58)	<b>.025</b>	8.8 (7.2, 10.7)	10.0 (8.1, 12.2)	.467
Predicted prevalence—full sample							
Outcome	Total <sup>b</sup>	Unadjusted percent (n)		p-value	Predicted prevalence (95% CI)		p-value
		Not teased	Teased		Not teased	Teased	
Dieting	1,518	48.5 (485)	63.0 (326)	<b>&lt;.001</b>	50.9 (47.3, 54.5)	58.6 (54.1, 63.4)	<b>.013</b>
Chronic dieting	1,518	10.7 (106)	15.4 (80)	<b>.007</b>	9.9 (8.2, 12.1)	12.0 (9.1, 15.6)	.255
UWCB	1,503	47.7 (472)	61.4 (316)	<b>&lt;.001</b>	50.5 (48.0, 53.1)	56.7 (50.1, 63.0)	.100
EWCB	1,509	11.0 (109)	16.1 (83)	<b>.005</b>	10.1 (8.3, 12.4)	11.8 (8.8, 15.7)	.402
Overeating	1,511	17.7 (176)	25.2 (130)	<b>&lt;.001</b>	17.2 (15.1, 19.5)	20.4 (17.7, 23.5)	<b>.028</b>
Binge eating	1,507	9.9 (98)	15.6 (80)	<b>.001</b>	9.2 (7.5, 11.3)	11.6 (9.9, 13.6)	.070

Note: Chi-square tests were used to estimate unadjusted percents. Logistic regression models were used to estimate incidence and longitudinal prevalence. They were adjusted for ethnicity/race, socioeconomic status, gender, body mass index percentile, and clustering by baseline school status. All covariates assessed at baseline. Weighted analyses. *p*-values bolded if statistically significant at the 0.05 significance level.

Abbreviations: EWCB, extreme weight control behaviors; UWCB, unhealthy weight control behaviors.

<sup>a</sup>For incidence, this column represents the number of participants without the outcome at baseline.

<sup>b</sup>For predicted prevalence, this column represents the total number of participants.

are now more ubiquitous among young people across sociodemographic characteristics (Neumark-Sztainer et al., 2012). It is also possible that, with regard to body dissatisfaction and the unrealistic thin white beauty ideal, young people who both live in larger bodies and identify as BIPOC have similar pressures to their white counterparts, but also have distinct experiences shaped by interconnected systems of weight stigma and racism (Watson, Lewis, & Moody, 2019).

This study found that (a) the relationship between weight teasing and DEBs did not vary based on ethnicity/race, SES, or gender, (b) the prevalence of DEBs and weight teasing was higher in BIPOC, low SES, and female participants when compared with their respective

counterparts. When taken together, these findings provide evidence against persistent assumptions that DEBs primarily affect young people who are affluent and white (Sonneville & Lipson, 2018) and suggest that future studies should center on the unique experiences of individuals more broadly oppressed by society such as young people who are BIPOC, low SES, female, or a combination of these identities. In addition, previous research has shown that young people living in larger bodies are disproportionately affected by both weight teasing and DEBs, and societal weight stigma, not biology, is thought to be the driving force for these associations (Rodgers et al., 2017; Thompson et al., 2020). Future studies should also investigate health

**TABLE 4** Prevalence of weight teasing and disordered eating behaviors by sociodemographic variables at baseline (EAT 2010, adolescence), unadjusted estimates

Outcome or predictor	Total % (n)	Ethnicity/race			Socioeconomic status			Gender		
		BIPOC % (n)	White % (n)	<i>p</i> -value	Low SES % (n)	Higher SES % (n)	<i>p</i> -value	Female % (n)	Male % (n)	<i>p</i> -value
Total	n/a	80.9 (1237)	19.1 (292)	n/a	39.5 (588)	60.5 (901)	n/a	53.7 (823)	46.3 (711)	n/a
Weight teasing	34.1 (523)	34.6 (427)	32.4 (94)	.482	38.9 (229)	31.1 (280)	<b>.002</b>	36.6 (301)	31.3 (222)	<b>.029</b>
Dieting	39.5 (604)	42.4 (523)	27.4 (80)	<b>&lt;.001</b>	44.5 (262)	36.0 (323)	<b>.001</b>	44.2 (364)	34.0 (240)	<b>&lt;.001</b>
Chronic dieting	10.3 (158)	11.5 (142)	5.0 (15)	<b>.001</b>	10.8 (64)	9.5 (86)	.415	10.7 (88)	9.9 (70)	.622
UWCB	43.6 (665)	46.7 (574)	30.8 (89)	<b>&lt;.001</b>	51.0 (299)	38.7 (346)	<b>&lt;.001</b>	49.4 (405)	37.0 (261)	<b>&lt;.001</b>
EWCB	4.2 (64)	4.8 (59)	2.0 (6)	<b>.033</b>	5.2 (31)	3.6 (32)	.132	5.5 (45)	2.8 (20)	<b>.009</b>
Overeating	13.3 (202)	13.8 (169)	11.2 (33)	.243	14.0 (82)	12.5 (112)	.385	17.4 (142)	8.5 (60)	<b>&lt;.001</b>
Binge eating	7.9 (120)	8.4 (103)	6.0 (17)	.169	8.6 (50)	7.1 (63)	.290	10.0 (81)	5.4 (38)	<b>.001</b>

Note: Weighted chi-square tests were used to estimate prevalence measures. *p*-values bolded if statistically significant at the 0.05 significance level. Abbreviations: BIPOC, Black, Indigenous, and People of Color; EWCB, extreme weight control behaviors; SES, socioeconomic status; UWCB, unhealthy weight control behaviors.

**TABLE 5** Prevalence of weight teasing and disordered eating behaviors by sociodemographic variables at follow-up (EAT 2018, young adulthood), unadjusted estimates

Outcome or predictor	Total % (n)	Ethnicity/race			Socioeconomic status			Gender		
		BIPOC % (n)	White % (n)	<i>p</i> -value	Low SES % (n)	Higher SES % (n)	<i>p</i> -value	Female % (n)	Male % (n)	<i>p</i> -value
Total	n/a	80.9 (1237)	19.1 (292)	n/a	39.5 (588)	60.5 (901)	n/a	53.7 (823)	46.3 (711)	n/a
Weight teasing	41.5 (618)	43.7 (523)	32.4 (93)	<b>&lt;.001</b>	44.7 (254)	39.5 (346)	.053	42.6 (340)	40.3 (278)	.383
Dieting	53.4 (811)	56.1 (686)	42.2 (122)	<b>&lt;.001</b>	55.9 (325)	51.9 (464)	.139	58.0 (472)	48.1 (339)	<b>&lt;.001</b>
Chronic dieting	12.3 (186)	13.3 (163)	7.6 (22)	<b>.007</b>	11.9 (69)	12.7 (114)	.623	13.7 (112)	10.6 (74)	.063
UWCB	52.4 (788)	54.9 (665)	41.9 (120)	<b>&lt;.001</b>	58.8 (339)	49.0(432)	<b>&lt;.001</b>	56.2 (453)	48.0 (335)	<b>.002</b>
EWCB	12.7 (192)	13.5 (164)	9.5 (27)	.068	16.5 (95)	10.6 (94)	<b>.001</b>	17.7 (143)	7.0 (49)	<b>&lt;.001</b>
Overeating	20.2 (306)	19.8 (241)	22.1 (63)	.377	19.6 (113)	20.7 (184)	.618	23.8 (193)	16.1 (113)	<b>&lt;.001</b>
Binge eating	11.8 (178)	12.1 (146)	10.6 (30)	.489	13.3 (76)	11.2 (99.0)	.222	15.6 (126)	7.5 (52)	<b>&lt;.001</b>

Note: Weighted chi-square tests were used to estimate prevalence measures. *p*-values bolded if statistically significant at the 0.05 significance level. Abbreviations: BIPOC, Black, Indigenous, and People of Color; EWCB, extreme weight control behaviors; SES, socioeconomic status. UWCB, unhealthy weight control behaviors.

disparities based on body size, including whether the relationship between weight teasing and DEBs differs by BMI.

#### 4.1 | Strengths and limitations

Our study has several strengths. First, our large sample included socioeconomically and ethnically/racially diverse adolescents and young adults. This factor offered a unique opportunity to use a health equity framework to comprehensively investigate relationships between weight teasing and DEBs across demographic groups. Second, extensive pilot testing ensured that the survey items were developmentally appropriate for the study population. Third, our longitudinal design allowed for examination of the temporal nature of the relationship between weight teasing and DEBs. Several limitations should also be noted. We relied on self-reported measures, so recall bias may be a limitation. However, self-report is likely the best measure for certain variables, such as experiencing weight stigma. In addition, weight teasing was assessed with a single item; future research should focus on the broad construct of weight stigma and use a comprehensive measure. Additionally, our longitudinal analyses did not assess whether weight teasing that persisted from adolescence to young adulthood was a risk factor for DEBs, but future studies should investigate this question to enhance understanding of these relationships. Due to low numbers, our “Mixed or Other Race” category included a heterogeneous group (Native Hawaiian or Pacific Islander, American Indian or Native American, Other, Other and another ethnicity/race), and the inability to consider these groups separately is a limitation. Finally, the binary nature of our gender variable and absence of data on sexual orientation are shortcomings, given that young people who identify as sexual minorities and/or gender minorities experience a higher prevalence of DEBs when compared with their respective straight and cisgender peers (Diemer, Grant, Munn-Chernoff, Patterson, & Duncan, 2015; Simone, Askew, Lust, Eisenberg, & Pisetsky, 2020). Future studies should inquire about sexual orientation and nonbinary gender identity and should aim to ameliorate these health disparities.

#### 4.2 | Implications

Given that in our sample, weight teasing and DEBs were more prevalent in BIPOC young people and those from low SES backgrounds, innovative approaches to research and policy development may be required to meet the needs of these young people. To this end, it may be useful to directly engage young people from these demographic groups who have experienced weight teasing and seek their input to inform future approaches to research and prevention efforts. For example, while weight-based bullying is the most common reason for harassment among adolescents (Bucchianeri et al., 2016), it is often absent from anti-bullying policies in schools (Puhl, Luedicke, & King, 2015). Young people could be asked directly for their input on ways to make anti-bullying policies appropriately inclusive of weight-

based harassment. Additional targets to help mitigate the potential harms of weight teasing and other forms of weight-based mistreatment may be primary care providers, family members, coaches, teachers, and guidance counselors (Golden et al., 2016; Pont, Puhl, Cook, & Slusser, 2017). These initiatives should attend to the needs of young people from low SES backgrounds and BIPOC young people and should include legal protections for those who experience weight-based mistreatment.

### 5 | CONCLUSIONS

Our study found that weight teasing was cross-sectionally associated with DEBs during both adolescence and young adulthood. There were fewer longitudinal associations, although weight teasing during adolescence predicted new-onset dieting, prevalent dieting, and prevalent overeating during young adulthood. The relationship between weight teasing and DEBs was similar across ethnicity/race, SES, and gender categories. Because both weight teasing and DEBs were more prevalent in BIPOC young people and those from low SES backgrounds, our findings demonstrate the importance of meeting the needs of young people from these demographic groups, and these efforts will likely require innovative approaches to future research and prevention efforts. Our findings add to the evidence that, when it comes to promoting health-supporting eating behaviors in young people, conveying stigma based on weight is not helpful and should be avoided by peers, family members, and healthcare providers.

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#### CONFLICT OF INTEREST

The authors have no conflict to declare.

#### AUTHOR CONTRIBUTION

Laura Hooper, Rebecca Puhl, Marla E. Eisenberg, Scott Crow, and Dianne Neumark-Sztainer helped with formulating the research questions, assisted with conceptualizing the analysis plan and interpretation of the results, contributed to writing the manuscript, and thoroughly reviewed the final manuscript. In addition, Laura Hooper formulated the research questions, conducted the statistical analysis, and drafted the manuscript. Marla E. Eisenberg oversaw the analysis

plan and statistical analysis. Dianne Neumark-Sztainer conceptualized the larger Project EAT study design and oversaw data collection.

## DATA AVAILABILITY STATEMENT

Investigators interested in utilizing the dataset used in the current study should contact the corresponding author.

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#### SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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