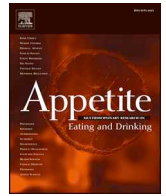




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Weight-based victimization, eating behaviors, and weight-related health in Sexual and Gender Minority Adolescents

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ABSTRACT

Weight-based victimization (WBV) is a common form of bullying associated with maladaptive eating, and poor weight-related health. Although sexual and gender minority (SGM) youth experience a number of eating and weight-related health disparities, the link between WBV and these outcomes has not been investigated in this vulnerable population. Data came from the *LGBTQ Teen Study*, a national survey of SGM adolescents. Participants provided data to assess body mass index (BMI), WBV, sexual identity, gender identity, dieting, binge eating, eating to cope with stress, weight control behaviors, exercise, and stress ($N = 9679$). The sample was 66% White, with a mean age of 15.6 years; 58.5% had healthy weight, and 37.2% had overweight or obesity. Over half of participants reported WBV from family members and peers. WBV from family members was associated with maladaptive eating (i.e., binge-eating, unhealthy weight-control behaviors), dieting, and poor weight-related health (i.e., stress, exercise avoidance, less physical activity and poorer sleep); relationships remained significant after accounting for participants' age, BMI percentile for age and sex, race, gender identity, and sexual identity. Higher frequency of WBV at school, but not history of peer weight-based victimization, was associated with more maladaptive eating, dieting, and poorer weight-related health on all outcomes except physical activity. This is the first large-scale study that examined links between WBV, maladaptive eating behaviors, and weight-related health in SGM adolescents. These results suggest the need for increased awareness that WBV may play a role in maladaptive eating, and weight-related health of SGM youth, and may contribute to both elevated levels of eating disorders and obesity in this population.

1. Introduction

Adolescence is a salient developmental period for sexual identity formation and maladaptive eating behaviors (Hudson, Hiripi, Pope, & Kessler, 2007; Miller & Luk, 2018). In adolescence, youth have increased vulnerability to poor body image (Suisman et al., 2012), self-objectification (Dakanalis et al., 2015), and peer influences that promote unhealthy eating and weight-related behaviors (Eisenberg & Neumark-Sztainer, 2010). Concurrently, sexual identity may interact with eating and weight-related health in important ways. Approximately 20% of U.S. adolescents have obesity (NCD Risk Factor Collaboration, 2017), and sexual minority females, relative to their heterosexual peers, are more likely to have overweight and obesity (Austin, Nelson, Birkett, Calzo, & Everett, 2013; Austin, Ziyadeh, Corliss, Haines, et al., 2009; Miller & Luk, 2018), leaving them vulnerable to weight-based victimization (WBV: teasing and bullying

related to high body weight) (Hales, Carroll, Fryar, & Ogden, 2017). WBV is one of the most common forms of bullying experienced in adolescence (Bucchianeri, Eisenberg, & Neumark-Sztainer, 2013; Neumark-Sztainer et al., 2010; Puhl, Luedicke, & Heuer, 2011; Puhl, Peterson, & Luedicke, 2013). Although research on WBV among sexual and gender minority youth (SGM; gay, lesbian, bisexual, transgender, queer) is scarce, recent evidence suggests that many SGM youth report experiencing WBV across diverse body weight categories (Puhl, Himmelstein, & Watson, 2019b). However, no studies have examined WBV and maladaptive eating, dieting, as well as weight-related health among SGM youth, despite their higher incidence of disordered eating behaviors (Miller & Luk, 2018; Watson, Veale, & Saewyc, 2017) and weight disparities (Austin et al., 2004, 2013; Austin, Ziyadeh, Corliss, Haines, et al., 2009).

Considerable evidence has documented health consequences of WBV among adolescents, including disordered eating (Eisenberg,

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Neumark-Sztainer, Haines, & Wall, 2006; Haines, Neumark-Sztainer, Eisenberg, & Hannan, 2006; King, Puhl, Luedicke, & Peterson, 2013; Puhl et al., 2017), obesity (Hunger & Tomiyama, 2014), avoidance of physical activity (Eisenberg et al., 2006; Faith, Leone, Ayers, Heo, & Pietrobelli, 2002; Haines et al., 2006), substance use (Puhl, Himmelstein, & Watson, 2019a), and psychological distress (Eisenberg, Neumark-Sztainer, & Story, 2003; Neumark-Sztainer, Falkner, et al., 2002). While this literature has focused almost exclusively on heterosexual youth, SGM adolescents may be at heightened risk for these adverse outcomes in response to WBV, in part because they have increased vulnerability for these outcomes in the absence of WBV. SGM youth are more likely than heterosexual youth to engage in disordered eating behaviors or harmful weight-control strategies (Austin, Ziyadeh, Corliss, Rosario, et al., 2009; Austin et al., 2004; Miller & Luk, 2018; Neumark-Sztainer, Wall, Larson, et al., 2012; Wichstrøm, 2006), and like WBV, sexual identity victimization is similarly associated with disordered eating (Watson, Adjei, Saewyc, Homma, & Goodenow, 2017).

Risks for disordered eating and unhealthy weight control may be particularly pronounced for sexual minority males (Ackard, Fedio, Neumark-Sztainer, & Britt, 2008; McClain & Peebles, 2016; Neumark-Sztainer, Wall, Larson, et al., 2012; Watson, Adjei, et al., 2017). Sexual minority males are less likely to engage in physical activity (Miller & Luk, 2018), more likely to report dieting to lose weight (Miller & Luk, 2018), and have higher levels of concern about body weight relative to heterosexual males (Calzo, Corliss, Blood, Field, & Austin, 2013; Calzo et al., 2015). While sexual minority females are more likely to have overweight and obesity (Austin et al., 2004, 2013; Austin, Ziyadeh, Corliss, Haines, et al., 2009), evidence on body norms (e.g., thin ideal), and body image concerns among sexual minority women relative to heterosexual women are mixed (Henrichs-Beck & Szymanski, 2016; Koff, Lucas, Migliorini, & Grossmith, 2010). Body norms and body image concerns among emerging sexual identities are unclear given the literature on emerging identities is in its infancy (Watson, Wheldon, & Puhl, 2019). Regardless of differences in body norms and body dissatisfaction among and between SGM youth, the association between WBV and adverse weight-related health outcomes is underexplored in this potentially vulnerable population.

SGM youth might also experience minority stress related to their sexual and gender identities (D'Augelli, Pilkington, & Hershberger, 2002; Lick, Durso, & Johnson, 2013; Meyer, 2009), which may partially explain both poor physical and psychological health in this population (Lick et al., 2013). Stress, particularly stress in response to WBV, has been implicated in exacerbating obesity, unhealthy eating, and weight-related health (Tomiyama, 2014). Previous research with lesbian women suggests that sexual minority stress is associated with poor body satisfaction and binge eating (Mason & Lewis, 2015); longitudinal evidence has demonstrated links between WBV in adolescence and eating to cope with stress and obesity 15 years later (Puhl et al., 2017). Likewise, sleep is a contributor to obesity (Taheri, Lin, Austin, Young, & Mignot, 2004), and sexual identity victimization is associated with sleep disturbance among both male and female adolescents (D'Augelli et al., 2002). Collectively, this evidence underscores a clear need for research examining WBV and weight-related health behaviors in SGM youth.

Given that health consequences of WBV in adolescence persist into adulthood (Hunger & Tomiyama, 2014; Puhl et al., 2017), and that SGM youth have been found to experience a multitude of health disparities (Saewyc, 2011), it is imperative to study WBV in SGM youth and identify those who may be most vulnerable to adverse health consequences. To address these neglected issues, this study utilized a large, national sample of SGM adolescents to examine the relationship between WBV and maladaptive eating behaviors (i.e., binge eating, unhealthy weight control strategies, coping with stress via eating),

dieting, and weight-related health (i.e., physical activity, exercise avoidance, sleep, and perceived stress). We expected WBV to be positively associated with maladaptive eating and dieting, and negatively associated with weight-related health.

2. Method

2.1. Participants

Participants (ages 13–17 years) completed the *LGBTQ National Teen Survey*, an online battery of questionnaires assessing daily experiences, health, and wellness of SGM adolescents (Watson et al., 2019). Adolescents who identified as LGBTQ, spoke English, and were currently living in the U.S. were eligible to participate. The full sample consisted of 17,112 SGM adolescents; data collection occurred in 2017, in partnership with the Human Rights Campaign (HRC). Participants were recruited nationally through HRC's diverse networks, community partners, and a comprehensive social media strategy (Watson et al., 2019). In exchange for participation, adolescents could enter a raffle to win gift cards and could sign up to receive HRC wristbands. Participants were recruited from all 50 states including 18.3% from the Northeast, 23.3% from the Midwest, 36.2% from the South and 22.2% from the West. All procedures were approved by the Institutional Review Board at the University of Connecticut. Details about the full survey and sample are reported elsewhere (Watson et al., 2019).

The present study focused on a subsample of participants ($N = 9838$ of 17,112) who provided complete information on survey measures of WBV, body mass index (BMI), and sexual identity. Compared to those who were missing information on these questions ($N = 7274$), this subsample was older ($M = 15.60$, $SD = 1.26$ versus $M = 15.53$, $SD = 1.27$), had a lower BMI percentile ($M = 66.63$, $SD = 30.40$ versus $M = 64.86$ years, $SD = 30.52$), were more likely to identify as White (66% versus 56%), Lesbian (20.9% versus 16.8%), and cisgender female (44% versus 42%).

2.2. Measures

2.2.1. Demographics and anthropometrics

Participants answered questions about their state of residence, age, race/ethnicity, weight in pounds, and height in inches. BMI percentiles for age and sex were calculated and categorized using growth charts from the Centers for Disease Control and Prevention; participants were classified as follows: underweight (BMI percentile < 5%), healthy weight (≥ 5 th to < 85th percentile), overweight (85th to < 95th percentile), and obesity (≥ 95 th percentile). Categorical BMI was used for descriptive purposes; all regression models included continuous BMI percentiles.

2.2.2. Sexual identity

Three questions assessed sexual identity. Participants indicated whether they would describe themselves as 'gay or lesbian,' 'bisexual,' 'straight, that is, not gay,' or 'something else.' If participants checked 'something else,' they were prompted with the additional responses: 'queer,' 'pansexual,' 'asexual,' 'questioning,' and 'other.' An 'other' response allowed participants to describe their sexual identity in their own words.

2.2.3. Gender identity

Participants indicated their sex at birth (male/female), as well as their current gender identity (all that applied). Options for gender identity included male, female, trans male/trans boy, trans female/trans girl, non-binary, gender queer/gender non-conforming. When sex at birth matched gender identity, participants were considered cisgender; when sex at birth and gender identity did not match,

participants were considered transgender. When participants indicated male or female as their birth sex, but indicated a non-binary and/or genderqueer/non-conforming gender identity, they were coded as assigned female at birth (AFAB) non-binary (female birth sex, non-binary/non-conforming) or assigned male at birth (AMAB) non-binary (male birth sex, non-binary/non-conforming) (Watson et al., 2019).

2.2.4. Weight-based victimization (WBV)

Participants indicated whether they had ever been teased or made fun of because of their weight by family members or peers using two yes/no questions from a longitudinal study examining weight-related behaviors in adolescents (Haines et al., 2006; Neumark-Sztainer, Falkner, et al., 2002; Puhl et al., 2017). A third question assessed frequency of WBV at school from peers, using a scale of 0 (*never*) to 4 (*very often*) (Puhl et al., 2013).

2.2.5. Dieting, binge eating, and strategies for weight-control

Questions assessing dieting, binge eating, and weight-control behaviors reflected measures from a longitudinal study examining weight-related behaviors in adolescents (Eisenberg & Neumark-Sztainer, 2010; Neumark-Sztainer et al., 2006; Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Neumark-Sztainer, Wall, Story, & Standish, 2012). Dieting was defined for participants as ‘changing the way you eat so you can lose weight.’ Participants indicated frequency of dieting in the last year using a scale from 0 (*never*) to 4 (*I am always dieting*) ($M = 0.98, SD = 1.21$). Binge eating was measured using four questions assessing the presence of binge eating (yes/no), with or without loss of control (yes/no), frequency of binge eating with loss of control (*every day to less than once per month*), and frequency of distress over binge eating (*not at all to a lot*) (Neumark-Sztainer et al., 2006). Following previous research (Neumark-Sztainer et al., 2006), these items were combined for a total score ranging from 1 to 4, with lower scores indicating more binge eating severity ($M = 3.07, SD = 1.04$). Strategies for weight-control (behaviors engaged in during the past year ‘in order to lose weight or keep from gaining weight’) were rated on a frequency scale from 0 (*never*) to 3 (*on a regular basis*). Healthy weight-control strategies included 6 items: trying to lose weight by exercising, eating fruits and vegetables, eating fewer sweets, eating fewer high fat foods, drinking less soda, and monitoring portion sizes ($M = 1.68, SD = 0.84, \alpha = 0.87$) (Neumark-Sztainer, Falkner, et al., 2002). Unhealthy weight-control strategies included fasting, restricting, taking dieting pills, vomiting, using laxatives, using diuretics, using food substitutes, skipping meals, and smoking ($M = 0.50, SD = 0.48, \alpha = 0.79$) (Neumark-Sztainer, Falkner, et al., 2002).

2.2.6. Physical activity & exercise avoidance

Physical activity was measured using the Godin Leisure Time Exercise Questionnaire, in which participants reported how often they engaged in different types of strenuous, moderate, or mild exercise for at least 15 min in a typical week (Godin & Shephard, 1997). The scoring formula weights strenuous activity more strongly than moderate or light activity, and higher scores reflect more physical activity ($M = 36.19, SD = 13.43$). Participants indicated whether they ever avoided exercise (yes/no). If they answered yes, they could select all that applied from a list of 11 common reasons for avoiding exercise (e.g., “it makes you sweat”). The variable represents a sum (including zero) for reasons to avoid exercise ($M = 4.33, SD = 4.00$).

2.2.7. Sleep, stress, and eating to cope with stress

Participants indicated how often they had trouble getting to sleep ($M = 2.15, SD = 1.19$, scale: 0 *never* to 4 *always*), as well as their average stress level in the last 30 days ($M = 2.12, SD = 2.22$), and their stress level in general ($M = 6.48, SD = 1.95$) using a scale of 1 (*not at all stressed*) to 10 (*very stressed*) (Wadden & Foster, 2006). Eating as a coping strategy was measured using the 5-item coping subscale from the Motivations to Eat Scale, in which participants indicated the

frequency that they used food to cope with stress on a scale of 0 (*almost never*) to 4 (*almost always*) ($M = 1.89, SD = 1.91, \alpha = 0.91$) (Jackson, Cooper, Mintz, & Albino, 2003).

2.3. Statistical analyses

Associations between WBV and weight-related health were examined using linear regressions. Models controlled for participants’ region of residence (Northeast reference group), age, BMI percentile for age and sex, race (White as reference group), gender identity (cisgender male as reference group), and sexual identity (straight as reference group). All participants with a cisgender-male identity had a minority sexual identity, and all participants with a “straight” sexual identity, had a minority gender identity. Region of residence was entered as a covariate because recent studies suggest that structural level variables, including region of residence, influence health outcomes among SGM individuals (Fisher, Irwin, & Coleman, 2014; Hatzenbuehler, 2014; Hatzenbuehler, Schwab-Reese, Ranapurwala, Hertz, & Ramirez, 2015; White Hughto, Murchison, Clark, Pachankis, & Reisner, 2016). Given the number of covariates, only those that were consistently associated with health outcomes were discussed in text, but results from all variables included in the models are available in Tables 1–3.

3. Results

3.1. Sample characteristics

Participants identified as White (66%), Biracial or Multiracial (13.7%), Hispanic or Latino (10%), Black, (4.2%), Asian (4%), or something else (2%). Participants identified as bisexual (33.7%), lesbian (20.6%), gay (16.3%), pansexual (13.8%), asexual (5%), queer (4.5%), questioning (2.3%), other (2.2%), and straight (1.6%). Participants identified as cisgender female (44%), AFAB non-binary (23%), cisgender male (21%), transgender male (8.7%), AMAB non-binary (2.1%), and transgender female (1.2%). The mean BMI was 24.26 ($SD = 6.30$) and mean BMI percentile was 64.86 ($SD = 30.52$). Using BMI percentiles for age and sex, the distribution of weight categories included healthy weight (58.5%), obesity (19.7%), overweight (17.5%), and underweight (4.3%). The mean frequency of experiencing WBV at school was 2.49 ($SD = 0.89$); 50.4% of adolescents reported that they had experienced WBV from peers and 55.4% reported WBV from family.

3.2. Dieting, binge eating, and strategies for weight-control

Linear regressions on dieting ($R^2 = 0.12, F(25, 9732) = 54.56, p < .001$), binge eating severity ($R^2 = 0.14, F(25, 9642) = 64.32, p < .001$), healthy strategies for weight-control ($R^2 = 0.13, F(25, 9684) = 57.89, p < .001$), and unhealthy strategies for weight-control ($R^2 = 0.21, F(25, 9642) = 99.59, p < .001$) accounted for 12–21% of the variance in each dependent variable (see Table 1). Frequency of WBV at school and weight-based teasing from family members were associated with more dieting (school: $\beta = 0.21, p < .001$; family: $\beta = 0.11, p < .001$), more severe binge eating (school: $\beta = -0.16, p < .001$; family: $\beta = -0.14, p < .001$), more healthy weight-control strategies (school: $\beta = 0.11, p < .001$; family: $\beta = 0.05, p < .001$), and more unhealthy weight-control strategies (school: $\beta = 0.29, p < .001$; family: $\beta = 0.16, p < .001$). Weight-based teasing from peers was associated with more severe binge eating ($\beta = -0.06, p < .001$), but was not associated with dieting frequency or weight-control strategies. BMI percentile and gender identity status (relative to cisgender boy) were consistently associated with more dieting (exception: transgender girl, and AMAB non-binary), more severe binge eating, more healthy weight-control strategies (exception: transgender girl, and AMAB non-binary), and more unhealthy weight control strategies (see Table 1).

Table 1
Linear Regressions on Dieting, Binge Eating, and Strategies for Weight-Control as a function of Weight-Based Victimization (WBV).

	Frequency of Dieting					Binge Eating Severity (lower scores = increased severity)						
	B	SE	β	p	95% CI	B	SE	β	p	95% CI		
<i>U.S. Region (ref: Northeast)</i>												
Midwest	-0.03	0.04	-0.01	.356	-0.10	0.04	0.01	0.03	0.00	.847	-0.05	0.07
South	0.00	0.03	0.00	.974	-0.06	0.07	0.01	0.03	0.01	.639	-0.04	0.07
West	0.00	0.04	0.00	.904	-0.08	0.07	-0.01	0.03	-0.01	.689	-0.07	0.05
Age	-0.02	0.01	-0.02	.099	-0.03	0.00	0.01	0.01	0.02	.091	0.00	0.03
BMI Percentile	0.01	0.00	0.12	.000	0.00	0.01	-0.01	0.00	-0.16	.000	-0.01	-0.01
<i>Racial Identity (ref: White)</i>												
Black	-0.09	0.06	-0.01	.140	-0.20	0.03	-0.01	0.05	0.00	.868	-0.11	0.09
Asian	-0.04	0.06	-0.01	.469	-0.16	0.07	0.07	0.05	0.01	.159	-0.03	0.17
Hispanic	0.02	0.04	0.00	.651	-0.06	0.10	0.00	0.03	0.00	.943	-0.07	0.07
Multiracial	0.08	0.03	0.02	.022	0.01	0.15	0.03	0.03	0.01	.402	-0.03	0.08
Something Else	0.14	0.09	0.02	.120	-0.04	0.32	-0.03	0.08	0.00	.674	-0.19	0.12
<i>Gender Identity (ref: Cisgender Boy)</i>												
Cisgender Girl	0.22	0.05	0.09	.000	0.12	0.31	-0.17	0.04	-0.08	.000	-0.26	-0.09
Transgender Boy	0.41	0.06	0.10	.000	0.29	0.53	-0.33	0.05	-0.09	.000	-0.43	-0.22
Transgender Girl	0.03	0.11	0.00	.812	-0.20	0.25	-0.24	0.10	-0.03	.013	-0.44	-0.05
AFAB Non-binary	0.28	0.05	0.10	.000	0.18	0.38	-0.29	0.05	-0.12	.000	-0.38	-0.20
AMAB Non-binary	0.06	0.08	0.01	.467	-0.10	0.22	-0.20	0.07	-0.03	.004	-0.34	-0.06
<i>Sexual Identity (ref: Straight)</i>												
Gay	0.05	0.08	0.02	.508	-0.21	0.05	-0.15	0.07	-0.05	.029	-0.28	-0.02
Lesbian	-0.08	0.07	-0.03	.228	-0.19	0.06	-0.02	0.06	-0.01	.677	-0.13	0.09
Bisexual	-0.07	0.06	-0.03	.297	-0.30	0.02	-0.10	0.06	-0.05	.058	-0.21	0.00
Queer	-0.14	0.08	-0.02	.082	-0.28	-0.01	-0.14	0.07	-0.03	.042	-0.28	-0.01
Pansexual	-0.15	0.07	-0.04	.030	-0.29	0.02	-0.11	0.06	-0.04	.060	-0.22	0.01
Asexual	-0.14	0.08	-0.03	.079	-0.30	0.08	0.03	0.07	0.01	.667	-0.10	0.16
Questioning	-0.11	0.10	-0.01	.244	-0.10	0.21	-0.13	0.08	-0.02	.111	-0.30	0.03
<i>Weight Stigma</i>												
Frequency of WBV	0.21	0.01	0.21	.000	0.19	0.24	-0.14	0.01	-0.16	.000	-0.16	-0.12
Peer Teasing	0.04	0.03	0.02	.222	-0.02	0.10	-0.12	0.03	-0.06	.000	-0.17	-0.06
Family Teasing	0.27	0.03	0.11	.000	0.22	0.32	-0.28	0.02	-0.14	.000	-0.33	-0.24

	Healthy Weight-Control Strategies					Unhealthy Weight-Control Strategies						
	B	SE	β	p	95% CI	B	SE	β	p	95% CI		
<i>U.S. Region (ref: Northeast)</i>												
Midwest	-0.04	0.03	-0.02	.097	-0.09	0.01	0.04	0.01	0.03	.006	0.01	0.06
South	-0.02	0.02	-0.01	.429	-0.06	0.03	0.05	0.01	0.05	.000	0.02	0.07
West	0.00	0.03	0.00	.947	-0.05	0.05	0.04	0.01	0.04	.002	0.02	0.07
Age	0.03	0.01	0.04	.000	0.01	0.04	0.00	0.00	0.01	.395	0.00	0.01
BMI Percentile	0.01	0.00	0.28	.000	0.01	0.01	0.00	0.00	0.09	.000	0.00	0.00
<i>Racial Identity (ref: White)</i>												
Black	-0.17	0.04	-0.04	.000	-0.25	-0.09	-0.01	0.02	-0.01	.603	-0.06	0.03
Asian	0.11	0.04	0.03	.010	0.03	0.19	-0.05	0.02	-0.02	.043	-0.09	0.00
Hispanic	-0.01	0.03	-0.01	.633	-0.07	0.04	0.02	0.02	0.02	.124	-0.01	0.05
Multiracial	-0.01	0.02	0.00	.734	-0.06	0.04	0.05	0.01	0.03	.001	0.02	0.07
Something Else	0.09	0.06	0.01	.151	-0.03	0.22	0.08	0.04	0.02	.028	0.01	0.15
<i>Gender Identity (ref: Cisgender Boy)</i>												
Cisgender Girl	0.22	0.03	0.13	.000	0.16	0.29	0.11	0.02	0.11	.000	0.07	0.14
Transgender Boy	0.16	0.04	0.05	.000	0.08	0.25	0.26	0.02	0.15	.000	0.22	0.31
Transgender Girl	-0.01	0.08	0.00	.865	-0.17	0.14	0.16	0.04	0.04	.000	0.07	0.24
AFAB Non-binary	0.15	0.04	0.07	.000	0.07	0.22	0.19	0.02	0.17	.000	0.15	0.23
AMAB Non-binary	0.00	0.06	0.00	.968	-0.11	0.12	0.08	0.03	0.03	.008	0.02	0.15
<i>Sexual Identity (ref: Straight)</i>												
Gay	0.09	0.06	0.04	.108	-0.02	0.20	0.03	0.03	0.03	.271	-0.03	0.09
Lesbian	-0.02	0.05	-0.01	.615	-0.11	0.07	-0.01	0.03	-0.01	.797	-0.06	0.04
Bisexual	-0.03	0.04	-0.02	.517	-0.12	0.06	0.01	0.02	0.01	.748	-0.04	0.06
Queer	-0.07	0.06	-0.02	.183	-0.18	0.04	-0.03	0.03	-0.01	.376	-0.09	0.03
Pansexual	-0.12	0.05	-0.05	.014	-0.21	-0.02	0.00	0.03	0.00	.981	-0.05	0.05
Asexual	-0.20	0.06	-0.05	.000	-0.31	-0.09	-0.05	0.03	-0.02	.111	-0.11	0.01
Questioning	-0.06	0.07	-0.01	.395	-0.19	0.07	0.03	0.04	0.01	.410	-0.04	0.10
<i>Weight Stigma</i>												
Frequency of WBV	0.08	0.01	0.11	.000	0.06	0.10	0.12	0.01	0.29	.000	0.11	0.13
Peer Teasing	0.03	0.02	0.02	.198	-0.02	0.07	0.00	0.01	0.00	.820	-0.02	0.03
Family Teasing	0.08	0.02	0.05	.000	0.04	0.11	0.15	0.01	0.16	.000	0.13	0.17

Note. WBV = weight-based victimization. AFAB = Assigned Female at Birth. AMAB = Assigned Male at Birth.

3.3. Physical activity & exercise avoidance

Table 2 displays results from each model on physical activity ($R^2 = 0.03$, $F(25, 9689) = 10.76$, $p < .001$) and exercise avoidance

($R^2 = 0.07$, $F(25, 9737) = 28.74$, $p < .001$). Accounting for WBV and controls explained a small, but meaningful proportion of the variance in exercise avoidance and physical activity. Frequency of WBV at school was associated with more physical activity ($\beta = 0.04$, $p = .003$), but

Table 2
Linear Regressions on Physical Activity and Exercise Avoidance as a function of Weight-Based Victimization (WBV).

	Physical Activity					Exercise Avoidance						
	B	SE	β	p	95% CI	B	SE	β	p	95% CI		
<i>U.S. Region (ref: Northeast)</i>												
Midwest	-0.05	0.42	0.00	.910	-0.88	0.78	0.14	0.12	0.02	.255	-0.10	0.38
South	-1.66	0.39	-0.06	< .001	-2.42	-0.90	0.07	0.11	0.01	.515	-0.15	0.30
West	0.65	0.43	0.02	.133	-0.20	1.49	0.03	0.13	0.00	.796	-0.21	0.28
Age	-0.77	0.11	-0.07	< .001	-0.99	-0.56	-0.14	0.03	-0.04	< .001	-0.20	-0.07
BMI Percentile	-0.01	0.01	-0.03	.003	-0.02	-0.01	0.01	0.00	0.07	< .001	0.01	0.01
<i>Racial Identity (ref: White)</i>												
Black	-2.09	0.68	-0.03	.002	-3.42	-0.76	-1.17	0.20	-0.06	< .001	-1.56	-0.78
Asian	-1.57	0.70	-0.02	.025	-2.94	-0.19	-0.04	0.20	0.00	.828	-0.45	0.36
Hispanic	-2.51	0.47	-0.06	< .001	-3.43	-1.59	-0.46	0.14	-0.03	.001	-0.72	-0.19
Multiracial	-0.36	0.40	-0.01	.367	-1.15	0.43	-0.22	0.12	-0.02	.062	-0.45	0.01
Something Else	1.30	1.07	0.01	.225	-0.80	3.40	-0.80	0.31	-0.03	.010	-1.41	-0.19
<i>Gender Identity (ref: Cisgender Boy)</i>												
Cisgender Girl	-3.11	0.58	-0.12	< .001	-4.24	-1.98	1.13	0.17	0.14	< .001	0.80	1.45
Transgender Boy	-3.61	0.72	-0.08	< .001	-5.01	-2.20	1.42	0.21	0.10	< .001	1.01	1.83
Transgender Girl	-4.88	1.33	-0.04	< .001	-7.48	-2.27	0.77	0.39	0.02	.048	0.01	1.53
AFAB Non-binary	-4.45	0.62	-0.14	< .001	-5.67	-3.23	1.69	0.18	0.18	< .001	1.33	2.04
AMAB Non-binary	-1.54	0.97	-0.02	.112	-3.44	0.36	0.74	0.28	0.03	.009	0.19	1.29
<i>Sexual Identity (ref: Straight)</i>												
Gay	-2.93	0.93	-0.08	.002	-4.75	-1.10	0.76	0.27	0.07	.005	0.23	1.29
Lesbian	-0.02	0.77	0.00	.981	-1.53	1.49	-0.09	0.22	-0.01	.677	-0.53	0.35
Bisexual	-1.25	0.75	-0.04	.096	-2.71	0.22	0.37	0.22	0.04	.091	-0.06	0.80
Queer	-2.38	0.95	-0.04	.012	-4.23	-0.53	0.32	0.27	0.02	.248	-0.22	0.86
Pansexual	-1.95	0.79	-0.05	.013	-3.49	-0.41	0.56	0.23	0.05	.015	0.11	1.01
Asexual	-2.35	0.92	-0.04	.011	-4.16	-0.55	0.70	0.27	0.04	.010	0.17	1.22
Questioning	-1.63	1.13	-0.02	.148	-3.85	0.58	0.86	0.33	0.03	.009	0.22	1.51
<i>Weight Stigma</i>												
Frequency of WBV	0.48	0.16	0.04	.003	0.17	0.78	0.27	0.05	0.08	< .001	0.18	0.36
Peer Teasing	-0.19	0.37	-0.01	.604	-0.91	0.53	0.32	0.11	0.04	.003	0.11	0.53
Family Teasing	-0.86	0.30	-0.03	.004	-1.45	-0.28	0.66	0.09	0.08	< .001	0.49	0.83

Note. WBV = weight-based victimization. AFAB = Assigned Female at Birth. AMAB = Assigned Male at Birth.

more reasons to avoid exercise ($\beta = 0.08, p < .001$). Family teasing was associated with lower levels of physical activity ($\beta = -0.03, p = .004$), as well as more reasons to avoid exercise ($\beta = 0.08, p < .001$), while teasing from peers was only associated with exercise avoidance ($\beta = 0.04, p = .003$), but not physical activity. BMI percentile and gender identity (relative to cisgender boy) were consistently associated with less physical activity (exception: AMAB non-binary) and more exercise avoidance (see Table 2).

3.4. Sleep, stress, and eating to cope with stress

As displayed in Table 3, accounting for WBV and controls explained between 6 and 11% of the variance in trouble falling sleep ($R^2 = 0.11, F(25, 9662) = 46.86, p < .001$), eating to cope with stress ($R^2 = 0.11, F(25, 9653) = 47.90, p < .001$), stress in the last 30 days ($R^2 = 0.07, F(25, 9607) = 28.30, p < .001$), and average stress in general ($R^2 = 0.05, F(25, 9579) = 21.86, p < .001$). Both frequency of WBV at school and teasing from family members were associated with more difficulty falling asleep (school: $\beta = 0.16, p < .001$; family: $\beta = 0.09, p < .001$) and a greater frequency of eating to cope with stress (school: $\beta = 0.18, p < .001$; family: $\beta = 0.11, p < .001$). Teasing from peers was not associated with these variables. Frequency of teasing at school and family teasing were associated with both stress in the last 30 days (school: $\beta = 0.19, p < .001$; family: $\beta = 0.07, p < .001$) and average stress level in general (school: $\beta = 0.16, p < .001$; family: $\beta = 0.07, p < .001$). Peer Teasing, however, was not associated with lower levels of reported stress in the last 30 days or lower average stress level in general ($\beta = -0.03, p = .050$). Gender identity (relative to cisgender boy) was consistently associated with more difficulty falling asleep, more coping with stress via eating, more stress in the last 30 days, and more average stress in general (exception: transgender girls). BMI percentile was associated with less stress in the last 30 days, less stress in general, but more coping with stress via eating (see Table 3).

4. Discussion

Findings of this study demonstrated consistent associations between WBV and adverse eating, dieting, and weight-related health behaviors in SGM adolescents. These relationships persisted after accounting for participants' age, BMI percentile, race, gender identity, and sexual identity. Collectively, these results indicate the need to include WBV in the broader context of weight-related health among SGM youth.

Family WBV was significantly associated with all weight-related health variables. Specifically, adolescents who reported experiencing WBV from family members reported more dieting, more severe binge eating, more engagement in weight-control strategies (healthy, unhealthy), lower physical activity, more reasons to avoid exercise, more difficulty falling asleep, more coping with stress by eating, more stress in the last 30 days, and higher average stress in general. Prior evidence has documented links between family WBV and adverse weight-related health in heterosexual youth (Balantekin, Birch, & Savage, 2018; Keery, Boutelle, Van Den Berg, & Thompson, 2005), including longitudinal associations of family WBV in adolescence with higher risk of obesity and maladaptive eating behaviors in adulthood (Puhl et al., 2017). Given that SGM youth are already at risk for parental rejection because of their sexual identity (Ryan, Huebner, Diaz, & Sanchez, 2009), these youth may be vulnerable to multiple adverse health outcomes in the home setting stemming from victimization related to both their weight status and sexual identity. Our findings thus underscore the importance of examining parental WBV and its implications for health of SGM youth.

In contrast to WBV from family members, WBV from peers was associated with more severe binge eating and more reasons to avoid exercise but was unrelated to dieting, weight-control behaviors, coping with stress by eating, exercise level, or sleep. History of WBV from peers was also associated with lower levels of reported stress. It is unclear why there were fewer associations between health indices and history

Table 3
Linear Regressions on Sleep, Stress, and Eating to Cope with Stress as a function of Weight-Based Victimization (WBV).

	Sleep					Coping with Stress via Eating						
	B	SE	β	p	95% CI	B	SE	β	p	95% CI		
<i>U.S. Region (ref: Northeast)</i>												
Midwest	0.10	0.04	0.04	.004	0.03	0.17	-0.01	0.03	0.00	.727	-0.08	0.05
South	0.13	0.03	0.05	< .001	0.07	0.20	0.00	0.03	0.00	.910	-0.06	0.06
West	0.09	0.04	0.03	.011	0.02	0.16	0.06	0.03	0.02	.065	0.00	0.13
Age	-0.08	0.01	-0.09	< .001	-0.10	-0.07	0.02	0.01	0.02	.083	0.00	0.03
BMI Percentile	0.00	0.00	-0.01	.623	0.00	0.00	0.00	0.00	0.11	< .001	0.00	0.00
<i>Racial Identity (ref: White)</i>												
Black	-0.25	0.06	-0.04	< .001	-0.36	-0.13	-0.06	0.05	-0.01	.245	-0.17	0.04
Asian	-0.20	0.06	-0.03	.001	-0.32	-0.09	0.00	0.05	0.00	.943	-0.11	0.10
Hispanic	0.00	0.04	0.00	.968	-0.08	0.08	-0.11	0.04	-0.03	.002	-0.18	-0.04
Multiracial	0.07	0.03	0.02	.041	0.00	0.14	-0.02	0.03	-0.01	.446	-0.08	0.04
Something Else	0.16	0.09	0.02	.077	-0.02	0.34	-0.03	0.08	0.00	.767	-0.19	0.14
<i>Gender Identity (ref: Cisgender Boy)</i>												
Cisgender Girl	0.29	0.05	0.12	< .001	0.20	0.39	0.32	0.04	0.15	< .001	0.23	0.41
Transgender Boy	0.64	0.06	0.15	< .001	0.52	0.76	0.35	0.06	0.09	< .001	0.24	0.46
Transgender Girl	0.35	0.12	0.03	.002	0.13	0.58	0.33	0.10	0.03	.001	0.13	0.54
AFAB Non-binary	0.57	0.05	0.20	< .001	0.46	0.67	0.41	0.05	0.16	< .001	0.32	0.51
AMAB Non-binary	0.40	0.08	0.05	< .001	0.24	0.57	0.31	0.08	0.04	< .001	0.16	0.45
<i>Sexual Identity (ref: Straight)</i>												
Gay	0.01	0.08	0.00	.914	-0.15	0.16	0.22	0.07	0.08	.002	0.08	0.36
Lesbian	-0.04	0.07	-0.01	.576	-0.17	0.09	0.06	0.06	0.02	.351	-0.06	0.17
Bisexual	-0.02	0.06	-0.01	.744	-0.15	0.10	0.16	0.06	0.07	.006	0.05	0.27
Queer	-0.11	0.08	-0.02	.177	-0.27	0.05	0.18	0.07	0.04	.011	0.04	0.33
Pansexual	0.04	0.07	0.01	.542	-0.09	0.17	0.16	0.06	0.05	.007	0.05	0.28
Asexual	0.05	0.08	0.01	.556	-0.11	0.20	0.01	0.07	0.00	.934	-0.13	0.15
Questioning	0.01	0.10	0.00	.941	-0.18	0.20	0.11	0.09	0.02	.216	-0.06	0.28
<i>Weight Stigma</i>												
Frequency of WBV	0.16	0.01	0.16	< .001	0.14	0.19	0.16	0.01	0.18	< .001	0.14	0.19
Peer Teasing	0.02	0.03	0.01	.575	-0.04	0.08	0.03	0.03	0.01	.375	-0.03	0.08
Family Teasing	0.23	0.03	0.09	< .001	0.18	0.28	0.25	0.02	0.11	< .001	0.20	0.29

	Stress in the Last 30 Days					Average Stress in General						
	B	SE	β	p	95% CI	B	SE	β	p	95% CI		
<i>U.S. Region (ref: Northeast)</i>												
Midwest	0.08	0.07	0.02	.266	-0.06	0.21	0.02	0.06	0.00	.791	-0.10	0.13
South	0.08	0.06	0.02	.227	-0.05	0.20	0.03	0.06	0.01	.587	-0.08	0.14
West	-0.01	0.07	0.00	.838	-0.15	0.12	-0.05	0.06	-0.01	.426	-0.17	0.07
Age	-0.05	0.02	-0.03	.011	-0.08	-0.01	-0.06	0.02	-0.04	< .001	-0.09	-0.03
BMI Percentile	0.00	0.00	-0.02	.025	0.00	0.00	0.00	0.00	-0.03	.003	0.00	0.00
<i>Racial Identity (ref: White)</i>												
Black	0.17	0.11	0.02	.118	-0.04	0.39	0.14	0.10	0.02	.145	-0.05	0.33
Asian	0.07	0.11	0.01	.536	-0.15	0.29	0.05	0.10	0.01	.595	-0.14	0.25
Hispanic	-0.08	0.08	-0.01	.314	-0.23	0.07	0.05	0.07	0.01	.475	-0.08	0.18
Multiracial	0.12	0.07	0.02	.061	-0.01	0.25	0.12	0.06	0.02	.036	0.01	0.23
Something Else	0.12	0.17	0.01	.493	-0.22	0.46	0.20	0.15	0.01	.192	-0.10	0.49
<i>Gender Identity (ref: Cisgender Boy)</i>												
Cisgender Girl	0.19	0.09	0.04	.038	0.01	0.38	0.18	0.08	0.05	.024	0.02	0.34
Transgender Boy	0.84	0.12	0.11	< .001	0.61	1.07	0.67	0.10	0.10	< .001	0.47	0.87
Transgender Girl	0.50	0.22	0.02	.022	0.07	0.93	0.28	0.19	0.02	.141	-0.09	0.65
AFAB Non-binary	0.62	0.10	0.12	< .001	0.42	0.82	0.51	0.09	0.11	< .001	0.33	0.68
AMAB Non-binary	0.66	0.16	0.04	< .001	0.35	0.97	0.51	0.14	0.04	< .001	0.24	0.77
<i>Sexual Identity (ref: Straight)</i>												
Gay	-0.06	0.15	-0.01	.677	-0.36	0.24	-0.11	0.13	-0.02	.400	-0.37	0.15
Lesbian	-0.02	0.13	0.00	.874	-0.27	0.23	-0.14	0.11	-0.03	.202	-0.35	0.08
Bisexual	-0.07	0.12	-0.01	.591	-0.31	0.17	-0.24	0.11	-0.06	.022	-0.45	-0.04
Queer	-0.04	0.15	0.00	.784	-0.34	0.26	-0.23	0.13	-0.03	.091	-0.49	0.04
Pansexual	0.01	0.13	0.00	.913	-0.24	0.27	-0.09	0.11	-0.02	.436	-0.31	0.13
Asexual	0.13	0.15	0.01	.400	-0.17	0.42	0.04	0.13	0.01	.746	-0.21	0.30
Questioning	0.01	0.18	0.00	.958	-0.35	0.37	-0.19	0.16	-0.02	.233	-0.50	0.12
<i>Weight Stigma</i>												
Frequency of WBV	0.36	0.03	0.19	< .001	0.31	0.41	0.26	0.02	0.16	< .001	0.22	0.31
Peer Teasing	-0.11	0.06	-0.03	.062	-0.23	0.01	-0.10	0.05	-0.03	.050	-0.20	0.00
Family Teasing	0.32	0.05	0.07	< .001	0.22	0.41	0.26	0.04	0.07	< .001	0.17	0.34

Note. WBV = weight-based victimization. AFAB = Assigned Female at Birth. AMAB = Assigned Male at Birth.

of WBV from peers compared to family members, as previous evidence with heterosexual youth has documented poor health behaviors linked to peer-based WBV (Bucchianeri, Eisenberg, Wall, Piran, & Neumark-Sztainer, 2014; Lampard, MacLehose, Eisenberg, Neumark-Sztainer, & Davison, 2014). However, the present study found consistent

associations between adolescents' reported frequency of WBV at school and adverse weight-related health (similar to WBV from family members). Thus, when it comes to WBV from peers, it may be the frequency of these experiences (rather than history of WBV) that carries stronger associations with adverse weight-related behaviors for SGM youth.

Overall, our findings suggest that SGM youth who experience WBV from family members and a higher frequency of WBV at school have poorer weight-related health. One exception is the finding that frequency of WBV at school was associated with higher physical activity levels (despite more reported reasons to avoid exercise); this is contrary to lower levels (or avoidance) of physical activity typically documented among heterosexual youth who experience WBV from peers (Jensen & Steele, 2009; Losekam, Goetzky, Kraeling, Rief, & Hilbert, 2010; Puhl & Luedicke, 2012). It could be that SGM youth who are teased about weight at school increase their physical activity try to change their weight and reduce future WBV from peers. As motivations for being physically active were not assessed, future work should examine this and other counter-intuitive findings (e.g., lower levels of stress reported by adolescents with a history of peer-based WBV, or the use of both healthy and unhealthy weight-control strategies endorsed by adolescents who reported WBV from family members and at school). Longitudinal research is a clear priority to help clarify associations between WBV, sources of these experiences, and weight-related health indices over time in SGM youth.

Although not a main focus of this paper, we found several consistent associations between covariates and health outcomes. Specifically, BMI percentile was associated with lower reported stress, and was consistently associated with poor weight-related health across all models except trouble sleeping. Cisgender girls, transgender boys, and AFAB non-binary individuals reported worse weight-related health associations relative to cisgender boys across outcomes. Transgender girls and AFAB non-binary individuals reported worse weight-related health relative to cisgender boys on all variables except average stress (transgender girls only), frequency of dieting, and healthy weight control strategies. Although previous studies have found relationships between sexual minority status, region of residence, age, and race/ethnicity and health outcomes (Fisher et al., 2014; Hatzenbuehler, 2014; Hatzenbuehler et al., 2015; Himmelstein, Puhl, & Quinn, 2017; White Hughto et al., 2016), no consistent associations among these variables emerged in these data. More research is needed to examine stigma processes at multiple levels (e.g., intrapersonal, interpersonal, community, structural) to understand the unique or overlapping relationships between these variables and health.

4.1. Limitations

Given the cross-sectional nature of the study design, causal inferences cannot be made. Also, despite a large, diverse sample of SGM youth, the sample is not nationally representative. Additionally, the survey was limited to adolescents with Internet access who spoke English. While this study focused on WBV, we did not examine bullying perpetration. Recent evidence found that the odds of being both a bullying perpetrator and victim were higher among SGM youth compared to heterosexual peers (Eisenberg, Gower, McMorris, & Bucchianeri, 2015). Thus, it will be informative for future work to examine this in the context of WBV, and whether being both a bully and victim of weight-based mistreatment incurs additional implications for poor health. In addition, WBV from family and peers was only assessed dichotomously (i.e., presence/absence), while teasing at school was assessed for frequency. Measuring frequency from different sources may be important for health outcomes (Himmelstein & Puhl, 2018), but we were unable to examine frequency in this study. Measurement is a general limitation in the literature on weight stigma, and clear standards as well as guidelines for assessing weight stigma (e.g., lifetime frequency, lifetime presence/absence, frequency in the last year, frequency from different interpersonal sources of stigma) are needed to help inform the broader literature.

4.2. Conclusions

This study reflects the first large-scale examination of links between

WBV, maladaptive eating, dieting, and weight-related health in SGM youth, with clear associations between WBV and these variables. These findings suggest the need for increased awareness that WBV may play a role in weight-related health of SGM youth, especially if these experiences occur with family members or frequently at school. Further, WBV may have negative implications for weight-related health regardless of adolescents' BMI. Given that over half of adolescents reported WBV from peers and family members, our findings suggest that WBV should be considered when examining weight-related health in SGM youth.

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Abbreviations

Assigned Female at Birth (AFAB); Assigned Male at Birth (AMAB); Body Mass Index (BMI); Human Rights Campaign (HRC); Lesbian, Gay, Bisexual, Transgender, Queer (LGBTQ); Sexual and Gender Minority Adolescents (SGM); Weight-Based Victimization (WBV).

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