


Sexual Minority Stressors, Internalizing Symptoms, and Unhealthy Eating Behaviors in Sexual Minority Youth

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Abstract

Background Sexual minorities are more likely than heterosexuals to engage in unhealthy eating behaviors.

Purpose The purpose of this study is to examine sexual minority stressors and internalizing symptoms as predictors of unhealthy eating behaviors among sexual minority youths.

Methods We used longitudinal data from 1461 sexual minority youths in the Growing Up Today Study, across ages 14–28 years. We hypothesized that sexual minority stressors would predict unhealthy eating behaviors, in part due to internalizing symptoms. Linear regression models fit via generalized estimating equations were stratified by gender and sexual orientation.

Results Significant positive and inverse associations between stressors and eating behaviors were detected among females and males, with more significant associations among females. Associations were attenuated by up to 71 % for females and

12 % for males when internalizing symptoms were added to the models.

Conclusions Sexual minority stressors predicted unhealthy eating behaviors overall and more so for some sexual orientation and gender groups; associations were partially explained by internalizing symptoms. The conceptual model appears to best describe the experiences of bisexual females. Findings have clinical implications for adolescent health.

Keywords Sexual minority · Minority stress · Internalizing symptoms · Coping mechanisms · Disinhibited eating

Obesity is widely recognized as an epidemic affecting adolescents and young adults [1, 2]. Sexual orientation disparities in obesity have been documented beginning in adolescence, with sexual minority females at greater likelihood and gay males at lower likelihood for obesity, compared to their same-gender heterosexual counterparts [3]. Research has demonstrated that female and male sexual minorities have higher rates than heterosexuals of unhealthy eating and weight control behaviors, including bingeing and purging [4], which may be used to cope with stressors unique to sexual minorities, such as increased victimization [5, 6]. Examining predictors of unhealthy eating behaviors in adolescence is crucial, because these behaviors may persist into young adulthood [7] with numerous negative health consequences. Both obesogenic (promoting weight gain) and leptogenic (promoting weight loss) eating behaviors are linked to negative mental and physical health consequences [8–10]. Sexual minorities are also more likely to experience internalizing symptoms, such as depression and anxiety, which may be a response to sexual minority stressors [11–13]. Although appearance concerns may also contribute to sexual orientation disparities in obesity [14], such disparities may arise from psychosocial processes

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related to stigma and stress. As yet, no research has examined associations among sexual minority stressors, internalizing symptoms, and unhealthy eating behaviors among sexual minority youths.

Here, we integrate Sexual Minority Stress Theory [11] and the Affective, Biological, Cognitive (ABC) Model of Depression [15] to further our understanding of the links between sexual minority stressors and unhealthy eating behaviors. Sexual Minority Stress Theory proposes that sexual minorities experience stressors related to the stigmatization of non-heterosexuality, and these stressors produce negative health outcomes [11]. Sexual minorities may use a variety of strategies to cope with minority stress, including unhealthy eating behaviors. The ABC Model of Depression proposes that affective (emotional reactivity), biological (genetic vulnerability, pubertal hormonal change, pubertal timing, and development), and cognitive (cognitive style, self-objectification, ruminative coping) factors represent vulnerabilities to depression [15]. These factors interact with negative life events, leading to higher rates of depression among females compared to males, beginning in adolescence [15]. Gender differences in depression, with females having higher rates than males, are also present among sexual minorities in adolescence and persist into young adulthood [16]. We suspect that vulnerabilities to depression interact with sexual minority stressors, such as victimization [6], differently in females versus males, leading to gender differences in depression among sexual minorities. This remains an empirical question. Sexual Minority Stress Theory and the ABC Model of Depression would predict that among sexual minorities, females will have different reactions than males to sexual minority stressors. In particular, gender differences may exist in the extent to which sexual minorities cope with minority stress by engaging in unhealthy eating behaviors. These patterns were explored in the current study.

Sexual minority developmental milestones are defined as specific markers that distinguish the emergence of sexual minority orientation identities [17]. Three primary milestones are as follows: first experiencing same-gender attractions, first having a same-gender sexual experience, and first identifying as a sexual minority. Sexual minorities experience stressors related to the stigmatization of non-heterosexuality [11] on both individual and interpersonal levels. Early identification as a sexual minority (e.g., in early adolescence)—or perception of sexual minority status by others—is an individual-level stressor that confers specific risks related to stigmatization associated with (assumed) membership in this group, including experiencing greater prejudice and discrimination [11] and victimization [6]. Sexual minorities who reach sexual minority developmental milestones (e.g., first identifying as a sexual minority) in early adolescence [18] may be at greater risk for negative outcomes related to stigma, because they may not be as developmentally equipped to cope with stressors as sexual

minorities who reach milestones later in adolescence or young adulthood. Previous research has indicated that, on average, sexual minority males reach sexual minority developmental milestones at an earlier age than sexual minority females [19–22], which may be linked to gender differences in experiences and coping with sexual minority stress. A study of adult gay and bisexual males found that participants who reached sexual minority developmental milestones at an earlier age were more likely to experience gay-related harassment during adolescence and gay-related victimization during adulthood and to be depressed compared to participants who reached sexual minority developmental milestones later [23]. However, these patterns have not been examined among sexual minority women. On an interpersonal level, sexual minorities experience higher rates of bullying (peer victimization) compared to their heterosexual counterparts [6]. Findings from the Growing Up Today Study (GUTS), a national prospective cohort of US adolescents and young adults, indicated that mostly heterosexuals, bisexual females, lesbians, and gay males were more likely to report being bullied, compared to same-gender heterosexuals [5].

Exposure to sexual minority stressors may prompt the use of unhealthy coping strategies. In particular, sexual minorities who reach sexual minority developmental milestones earlier, especially in early adolescence, may have less well-developed coping strategies and access to resources, compared to sexual minorities who reach developmental milestones later. For example, a study of sexual orientation development and alcohol use among adult lesbians found that women who disclosed their sexual orientation identity to others at a younger age were more likely to have alcohol consumption-related problems than women who disclosed their sexual orientation identity to others at an older age [24], suggesting that lesbians who reach developmental milestones earlier may be using alcohol to cope with stressors.

Sexual minorities may also use unhealthy eating behaviors as coping mechanisms. Though eating serves a range of biological and psychological functions, research has established that both females and males endorse eating as a way to cope with negative affect (“coping-motivated eating”) [20]. Disinhibited eating, also known as uncontrolled eating, is described as the “tendency to eat more than usual due to a loss of control over intake accompanied by subjective feelings of hunger” [21]. Other research has found that disinhibited eating in the form of binge eating is often used as a way to cope with negative affect [25–27]. Sexual minorities are at greater risk for eating disorder symptomatology compared to heterosexuals [4, 28]. These disparities may be an indication that sexual minority youths are using unhealthy eating behaviors to cope with sexual minority stressors, though to our knowledge, this link has not been tested directly.

The association between sexual minority stressors and unhealthy eating behaviors could be mediated by psychological

responses to the stressors. Compared to heterosexuals, sexual minorities are at greater risk for internalizing symptoms, such as depression and anxiety [11–13], in part because sexual minorities are disproportionately exposed to stressors, such as bullying and victimization [11]. Increased internalizing symptoms may put sexual minority youths at greater risk for using unhealthy eating behaviors to cope with stressors. Previous research has not examined gendered psychological stress response pathways from sexual minority stressors to unhealthy eating behaviors among sexual minority youths. The ABC Model of Depression would suggest that female and male sexual minority youths will respond differently to sexual minority stressors, with females demonstrating greater internalizing symptoms than males, leading to differential associations with unhealthy eating behaviors. There are likely multiple pathways through which sexual minority stressors are associated with unhealthy eating behaviors among youths; we examine internalizing symptoms as one such pathway.

The aims of the current study were to examine individual-level (younger age of achievement of sexual minority developmental milestones) and interpersonal-level (bullying victimization) sexual minority stressors and internalizing symptoms (depressive and anxious symptoms) as predictors of unhealthy eating behaviors (coping-motivated eating and disinhibited eating) among sexual minority youths, using longitudinal data from GUTS. We hypothesized that (1) greater exposure to sexual minority stressors (younger age of achievement of sexual minority developmental milestones, greater bullying victimization) would predict more unhealthy eating behaviors (coping-motivated eating, disinhibited eating) and (2) internalizing symptoms (depressive and anxious symptoms) would partially account for associations between sexual minority stressors and unhealthy eating behaviors. The hypothesized theoretical model is displayed in Fig. 1.

Methods

Study Sample

Participants were 1098 females and 363 males who participated in GUTS wave 2010 (ages 23 to 28 years), although measures were also included from waves 1996 (ages 9 to 14 years), 2001 (ages 14 to 19 years), and 2007 (ages 20 to 25 years). GUTS is a national ongoing longitudinal cohort study of children of women nurses participating in the Nurses' Health Study II [29]; other recruitment information is detailed elsewhere [30]. Youth ages 9 to 14 years ($N=16,882$) were originally enrolled in 1996 and have been followed longitudinally. Assessments occurred via paper or online survey and included a range of measured outcomes. The racial/ethnic breakdown of the sample is 90.8 % White and 9.2 % other race/ethnicities. In 2010, 62 % (56.7 % of boys, 63.7 % of girls) were healthy

weight, 34.2 % (41.4 % of boys, 31.8 % of girls) were overweight or obese, and 3.8 % (1.9 % of boys, 4.5 % of girls) were underweight. All participants gave informed consent prior to participation in any wave of data collection. This study was approved by the Brigham and Women's Hospital Institutional Review Board.

Measures

Youths were assessed during the following years: 1996, 1997, 1998, 1999, 2000, 2003, 2005, 2007, and 2010. The current study included measures assessed in 1996 (age, race/ethnicity), 2001 (sexual orientation, bullying victimization), 2007 (sexual orientation), and 2010 (sexual orientation, sexual minority developmental milestones, coping-motivated eating, disinhibited eating, depressive symptoms, and anxious symptoms). These measures are described in detail below.

Measures—Predictors

Sexual Minority Developmental Milestones

Sexual minority developmental milestones were assessed in 2010 with three items adapted from the Sexual Risk Behavior Assessment Schedule—Youth (SERBAS-Y) [31]. Endorsement of the milestone (*yes, no*) and age in years when the milestone was first experienced among participants who provided a *yes* response were assessed for each of the following milestones: (1) same-gender sexual attraction; (2) identification as mostly heterosexual, bisexual, lesbian, or gay; and (3) same-gender sexual experience.

Bullying Victimization

Bullying victimization in the past year was assessed in 2001 with one item adapted from the World Health Organization Health Behavior of School-Aged Children Survey [32], "During the past year, how often have you been bullied?" The item was measured on a five-point scale with the following response options: *I haven't been bullied, once or twice, sometimes, about once a week, several times a week*. Higher scores indicated greater frequency of being victimized (range 1 to 5).

Measures—Outcomes

Coping-Motivated Eating

Coping-motivated eating was assessed in 2010 with five items from the Coping subscale of the Motivations to Eat Scale [33]. Sample items include the following: "How often do you eat because you are depressed or sad?" and "How often do you eat as a way to help you cope?" Items were measured on a five-point Likert scale from *almost never or never* (1) to

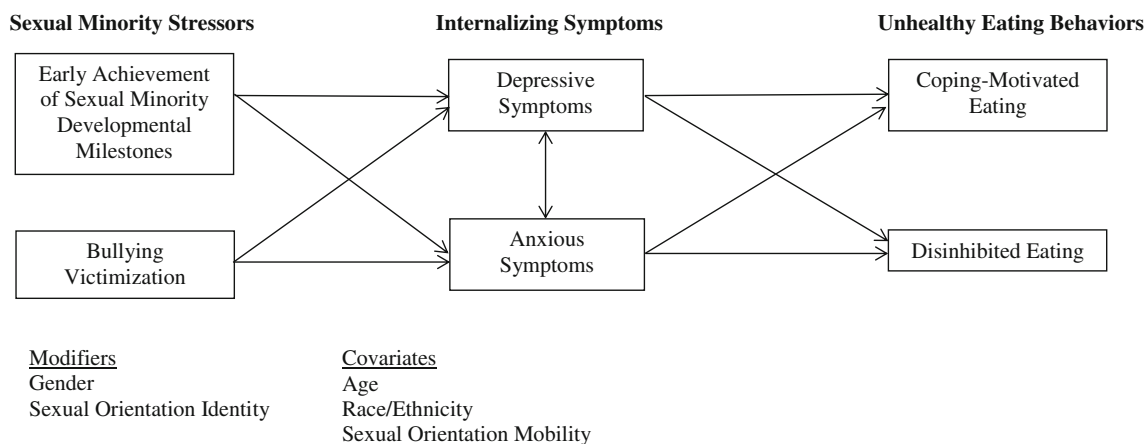


Fig. 1 Hypothesized conceptual model of the psychological stress pathway from sexual minority stressors to unhealthy eating behaviors among sexual minority youths

almost always or always (5). A mean scale score was created, with higher scores indicating greater engagement in coping-motivated eating (range 1 to 5). In this sample, scale reliability was $\alpha=0.91$ for females and $\alpha=0.90$ for males.

Disinhibited Eating

Disinhibited eating was assessed in 2010 with ten items from the Disinhibited Eating subscale of the Three-Factor Eating Questionnaire (TFEQ) [34]. Seven items were measured with *true/false* response options. Other items were measured as follows: “Do you eat sensibly in front of others and splurge alone?” (*never, rarely, often, always*), “Do you go on eating binges though you are not hungry?” (*never, rarely, sometimes, at least once a week*), “To what extent does this statement describe your eating behavior? ‘I start dieting in the morning, but because of any number of things that happen during the day, by evening I have given up and eat what I want, promising myself to start dieting again tomorrow’” (*not like me, little like me, pretty good, describes me*). The items were scored as follows: true/false items, true=1, false=0; other items, first two response options (*never, rarely; not like me, little like me*)=0, second two response options (*often, always; sometimes, at least once a week; pretty good, describes me*)=1. A composite scale score was created by summing the responses for all items, with higher scores indicating greater engagement in disinhibited eating (range 0 to 10).

Measures—Mediators

Depressive Symptoms

Depressive symptoms were assessed in 2010 with ten items from the Center for Epidemiologic Studies Depression (CESD) scale short form [35]. Items were measured on a four-point Likert scale from *rarely or none of the time* (0) to *all of the time* (4). A composite scale score was created by

summing the responses for all items, with higher scores indicating greater depressive symptomatology (range 0 to 30). In this sample, scale reliability was $\alpha=0.82$ for females and $\alpha=0.81$ for males.

Anxious Symptoms

Anxious symptoms were assessed in 2010 with nine items from the Worry/Sensitivity subscale of the Revised Children’s Manifest Anxiety Scale (RCMAS) [36]. Items were measured on a six-point Likert scale from *none of the time* (0) to *all of the time* (6). A composite scale score was created by summing the responses for all items, with higher scores indicating greater anxious symptomatology (range 0 to 45). In this sample, scale reliability was $\alpha=0.93$ for females and $\alpha=0.92$ for males.

Measures—Modifiers

Sexual Orientation

Sexual orientation was assessed in waves 2001, 2007, and 2010 with the item “Which of the following best describes your feelings?” and the following response options: *completely heterosexual (attracted to persons of the opposite sex), mostly heterosexual, bisexual (equally attracted to men and women), mostly homosexual, completely homosexual (gay/lesbian, attracted to persons of the same sex), and not sure*. Sexual orientation groups were modeled based on the 2010 report and back-assigned to 2001. When the 2010 report was missing, then the 2007 report was used; when the 2010 and 2007 reports were missing, the 2001 report was used. Mostly homosexual and completely homosexual were combined into lesbian/gay due to small sample sizes. This yielded the following sexual orientation groups: mostly heterosexual, bisexual, and lesbian/gay.

Measures—Covariates

Age in years and race/ethnicity (*White, non-White*) were assessed in 1996. Sexual orientation mobility assessed changes in reported sexual orientation using data from all available waves [37, 38]. A score was assigned to each participant based on the number of times that sexual orientation changed. Scores ranged from 0 (no change at any assessment) to 1 (change at every assessment), with higher scores indicating greater sexual orientation mobility.

Statistical Analysis

The original sample size of youths participating in GUTS wave 2010 was 8690 youths (5630 females, 3060 males). Participants were excluded if they were missing data for sexual orientation at all waves in the current study ($n=51$). Participants were also excluded if they answered “completely heterosexual” ($n=7176$) or reported a transgender identity ($n=2$) in wave 2010. The final sample size was 1461 (1098 females, 363 males).

Participants were characterized using descriptive statistics and compared between females and males and among sexual orientation groups within females and within males. Continuous variables were compared via *t* tests, and categorical variables were compared via chi-square tests. Coping-motivated eating and disinhibited eating were modeled separately for each sexual orientation group within females and males, because we expected gender and sexual orientation group differences and because each gender and sexual orientation group differentially identified sexual minority milestones. A linear association between milestone age and unhealthy eating behaviors was assumed after testing for non-linearity in the associations. For each outcome and milestone type, two models were fit. The first model (model 1) included only the sexual minority stressor variables (sexual minority milestone age and bullying victimization). In the second model (model 2), internalizing symptoms (anxiety and depression) were added. Parameter estimates were compared between model 1 and model 2 to assess attenuation of the relationship between sexual minority stressors and unhealthy eating by internalizing symptoms. Models were fit using generalized estimating equations assuming a compound symmetric working correlation structure to account for clustering within families (when multiple siblings were included in the study). All models adjusted for age, race/ethnicity, and sexual orientation mobility. Models were fit with SAS Version 9.3, and significance was considered at a two-sided 0.05 level.

Results

Descriptive statistics for all measures are reported by gender in Table 1. Descriptive statistics are reported by gender and

sexual orientation group in Table 2. Results from model 1 (sexual minority stressors alone) and model 2 (both sexual minority stressors and internalizing symptoms) for the coping-motivated outcome are reported in Table 3. Results from model 1 and model 2 for the disinhibited eating outcome are reported in Table 4.

Sexual Minority Stressors and Unhealthy Eating Behaviors

Age of Achievement of Sexual Minority Developmental Milestones

Experiencing same-gender attractions earlier was associated with more coping-motivated eating among bisexual females, but less coping-motivated eating among mostly heterosexual females (Table 3). Identifying as a sexual minority earlier was associated with more disinhibited eating among lesbians and gay males (Table 4). No other significant associations were found between age of achievement of sexual minority developmental milestones and unhealthy eating behaviors among males. Therefore, hypothesis 1 was partially supported in that earlier timing of milestones was associated with more unhealthy eating behaviors for some subgroups.

Bullying Victimization

Greater bullying victimization was associated with more coping-motivated eating among bisexual females and gay males, but less coping-motivated eating among lesbians and bisexual males (Table 3). Greater bullying victimization was associated with more disinhibited eating among bisexual females and mostly heterosexual females (Table 4). No significant associations were found between bullying victimization and disinhibited eating among males. Therefore, hypothesis 1 was partially supported in that greater bullying victimization was associated with more unhealthy eating behaviors for some subgroups.

Attenuation by Internalizing Symptoms

Internalizing Symptoms and Unhealthy Eating Behaviors

Depressive symptoms were inversely associated with coping-motivated eating among mostly heterosexual females (Table 3) and disinhibited eating among lesbians (Table 4). Depressive symptoms were not significantly associated with unhealthy eating behaviors among males. Anxious symptoms were positively associated with coping-motivated eating among mostly heterosexual females, lesbians, and gay males (Table 3). Anxious symptoms were positively associated with disinhibited eating among lesbians (Table 4).

Table 1 Descriptive statistics^a for female ($N=1098$) and male ($N=363$) youths in the Growing Up Today Study

Measure	Total ($n=1461$)	Females ($n=1098$)	Males ($n=363$)	Females vs. males (p value ^b)
Predictors				
Sexual orientation identity (n , %)				
Mostly heterosexual	1090 (74.6)	860 (78.3)	230 (63.4)	<0.001
Bisexual	165 (11.3)	144 (13.1)	21 (5.8)	<0.001
Lesbian/gay	206 (14.1)	94 (8.6)	112 (30.9)	<0.001
Sexual minority developmental milestones (age in years, M/SD)				
Same-gender attraction (range 0–27)	16.3 (4.3)	16.7 (4.1)	15.0 (5.0)	<0.001
Sexual minority identity (range 3–28)	17.3 (4.0)	17.6 (3.9)	16.6 (4.2)	0.002
Same-gender sexual experience (range 4–27)	17.8 (4.2)	18.1 (4.1)	16.8 (4.6)	0.001
Bullying victimization (M/SD , range 1–5)	1.3 (0.7)	1.3 (0.6)	1.5 (0.8)	<0.001
Outcomes				
Coping-motivated eating (M/SD , range 1–5)	2.0 (0.9)	2.1 (0.9)	1.7 (0.8)	<0.001
Disinhibited eating (M/SD , range 0–10)	3.4 (2.5)	3.6 (2.6)	2.8 (2.3)	<0.001
Mediators				
Depressive symptoms (M/SD , range 0–30)	9.0 (5.1)	8.9 (5.1)	9.1 (4.9)	0.49
Anxious symptoms (M/SD , range 0–45)	16.1 (8.8)	16.8 (8.9)	13.7 (8.1)	<0.001
Covariates				
Age (years, M/SD , range 22–30)	25.4 (1.6)	25.4 (1.6)	25.3 (1.7)	0.81
Ethnicity (n , %)				
White	1323 (90.8)	1004 (91.8)	319 (87.9)	0.03
Non-White	134 (9.2)	90 (8.2)	44 (12.1)	
Sexual orientation mobility (M/SD , range 0–1)	0.4 (0.2)	0.4 (0.2)	0.4 (0.2)	<0.001

^a All numbers are rounded to the nearest tenth

^b Chi-square and t tests were used to test for gender differences

Attenuation by Internalizing Symptoms

Associations between sexual minority stressors and unhealthy eating behaviors were attenuated by up to 71 % for females (Tables 3 and 4). All but three associations remained significant when internalizing symptoms were added to the models. For instance, the positive association between the timing of same-gender attractions and coping-motivated eating among mostly heterosexual females was attenuated by 71 % (from 0.07 to 0.02) and became non-significant when depressive and anxious symptoms were added to the model (Table 3). Therefore, among females, hypothesis 2 was partially supported in that internalizing symptoms partially explained some associations.

Among the three significant associations between sexual minority stressors and unhealthy eating behaviors among males, two associations demonstrated attenuation by internalizing symptoms. The inverse association between bullying victimization and coping-motivated eating among bisexual males was attenuated by 12 % (from -0.34 to -0.30 ; Table 3) and became non-significant when depressive and anxious symptoms were added to the model. The inverse association between the timing of sexual minority identification

and disinhibited eating among gay males was attenuated by 8 % (-0.24 to -0.22) but remained significant when internalizing symptoms were added to the model (Table 4). Therefore, among males, hypothesis 2 was partially supported in that internalizing symptoms partially explained some associations.

Discussion

The goals of this research were to examine sexual minority stressors as predictors of unhealthy eating behaviors among sexual minority youths and to investigate whether internalizing symptoms explained these associations. Earlier achievement of sexual minority developmental milestones and experiences of bullying victimization were found to be significantly associated with coping-motivated eating and disinhibited eating; depending upon gender and sexual orientation, the association was positive in some cases and inverse in other cases. As predicted, reaching a sexual minority developmental milestone earlier was associated with more coping-motivated eating among bisexual females and more disinhibited eating among lesbians and gay males. Also, as predicted, greater

Table 2 Descriptive statistics^a by sexual orientation for female ($N=1098$) and male ($N=363$) youths in the Growing Up Today Study

Measures	Females				Males			
	Mostly hetero ($n=860$)	Bisexual ($n=144$)	Lesbian ($n=94$)	p value ^b	Mostly hetero ($n=230$)	Bisexual ($n=21$)	Gay ($n=112$)	p value ^b
Predictors								
Sexual minority developmental milestones (age in years; M/SD)								
Sexual minority identity (range 3–28)	17.7 (3.8)	16.9 (4.0)	17.6 (3.7)	0.14	17.8 (4.0)	15.3 (3.5)	15.0 (3.9)	<0.001
Same-gender attractions (range 0–27)	17.4 (3.8)	14.5 (4.3)	14.8 (4.4)	<0.001	17.3 (4.6)	16.1 (4.3)	11.9 (3.6)	<0.001
Same-gender sexual experience (range 4–27)	18.1 (4.2)	17.9 (4.0)	18.3 (3.5)	0.78	16.3 (5.7)	18.6 (3.7)	16.9 (3.7)	0.28
Bullying victimization (M/SD , range 1–5)	1.3 (0.6)	1.3 (0.8)	1.3 (0.6)	0.56	1.5 (0.7)	1.5 (1.2)	1.6 (0.9)	0.36
Outcomes								
Coping-motivated eating (M/SD , range 1–5)	2.1 (0.9)	2.0 (0.9)	1.9 (0.8)	0.09	1.6 (0.7)	1.9 (0.9)	1.7 (0.8)	0.07
Disinhibited eating (M/SD , range 0–10)	3.7 (2.6)	3.4 (2.5)	3.1 (2.4)	0.09	2.7 (2.2)	3.4 (2.6)	2.9 (2.5)	0.44
Mediators								
Depressive symptoms (M/SD , range 0–30)	8.7 (5.0)	9.9 (5.5)	9.2 (5.3)	0.04	9.3 (4.6)	10.4 (5.6)	8.6 (5.2)	0.25
Anxious symptoms (M/SD , range 0–45)	16.8 (8.7)	17.4 (10.7)	16.6 (7.9)	0.74	13.7 (8.1)	15.5 (10.4)	13.5 (7.8)	0.64

^a All numbers are rounded to the nearest tenth

^b ANOVA tests were used to test for within-gender sexual orientation group differences

bullying victimization was associated with more coping-motivated eating among bisexual females and gay males and more disinhibited eating among mostly heterosexual and bisexual females. These findings support our conceptual model based on Sexual Minority Stress Theory [11], such that greater exposure to sexual minority stressors (earlier achievement of sexual minority developmental milestones and/or experiencing greater bullying victimization) was associated with more unhealthy eating behaviors. These associations were found among mostly heterosexual females, bisexual females, lesbians, and gay males. However, the opposite pattern was found for some associations. Contrary to predictions, later achievement of same-gender attractions was associated with more coping-motivated eating among mostly heterosexual females, and greater bullying victimization was associated with less coping-motivated eating among lesbians and bisexual males.

Associations between sexual minority stressors and unhealthy eating behaviors were significant in the hypothesized direction more often for bisexual females than for other gender-sexual orientation groups. Other research has indicated that bisexual females have poorer mental and physical health outcomes compared to other female sexual minority groups [39–41], and previous research from GUTS suggested that elevated BMI in bisexual females compared to heterosexual females was partially explained by disparities in child abuse and obesogenic weight-related behaviors [42]. Elevated adverse health outcomes for bisexuals may be related to experiencing biphobia from both heterosexual and sexual minority communities [43]. Biphobia may lead to greater social isolation and exposure to sexual minority stressors among bisexuals,

resulting in the need for greater engagement in coping mechanisms, including unhealthy eating behaviors, among this sexual orientation group. Medical and mental health providers working with bisexual female youths should be aware that this group may be more likely to engage in unhealthy eating behaviors as a way of coping with sexual minority stress.

Contrary to predictions, experiencing same-gender attractions later was associated with more coping-motivated eating among mostly heterosexual females. Although some previous research has indicated that earlier timing of sexual minority developmental milestones is related to unhealthy coping behaviors among adult lesbians [24], those findings were not replicated in associations between the timing of milestones and unhealthy eating behaviors among mostly heterosexual female and bisexual male youths. It appears that for youths in these gender-sexual orientation groups, later timing of sexual minority developmental milestones may confer greater risk for engaging in unhealthy eating behaviors.

Some theorists have proposed that membership in a stigmatized group may be protective for self-esteem through mechanisms such as attributing negative feedback to prejudice against the group [44]. Perhaps, mostly heterosexual females do not benefit from the protective aspect of membership as a sexual minority in the same way as other sexual minority groups. Research conducted specifically with mostly heterosexuals [45] and bisexuals [46, 47] and with these groups in combination with other sexual minorities [3, 42] is growing. However, comparatively little is known about these groups, particularly regarding timing of sexual minority developmental milestones and associations with unhealthy coping

Table 3 Coping-Motivated eating (Outcome) GEE linear regression coefficients^a for models^b testing the associations between sexual minority stressors and unhealthy eating behaviors and attenuation by psychological stress responses among female ($N=1098$) and male ($N=363$) youth in the growing up today study

Measures	Females					
	Mostly heterosexual		Bisexual		Lesbian	
	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)
Sexual minority stressors						
Sexual minority identity milestone age	–	–	–0.02 (0.0)	–0.01 (0.0)	–0.03 (0.0)	–0.02 (0.0)
Bullying victimization	–	–	0.39 (0.1)	0.34 (0.1)	–0.54 (0.2)	–0.57 (0.1)
Psych stress responses						
Depressive symptoms	–	–	0.02 (0.0)	0.02 (0.0)	0.04 (0.0)	0.04 (0.0)
Anxious symptoms	–	–	0.01 (0.0)	0.01 (0.0)	0.03 (0.0)	0.03 (0.0)
Sexual minority stressors						
Same-gender attractions milestone age	0.07 (0.0)	0.02 (0.0)	–0.02 (0.0)	–0.01 (0.0)	0.00 (0.0)	0.01 (0.0)
Bullying victimization	0.22 (0.2)	–0.47 (0.3)	0.42 (0.1)	0.37 (0.1)	–0.36 (0.2)	–0.47 (0.1)
Psych stress responses						
Depressive symptoms		–0.19 (0.1)		0.02 (0.0)		0.04 (0.0)
Anxious symptoms		0.07 (0.0)		0.01 (0.0)		0.03 (0.0)
Sexual minority stressors						
Same-gender sexual experience milestone age	–	–	–	–	–0.04 (0.0)	–0.02 (0.0)
Bullying victimization	–	–	–	–	–0.38 (0.2)	–0.48 (0.1)
Psych stress responses						
Depressive symptoms	–	–	–	–	–	0.04 (0.0)
Anxious symptoms	–	–	–	–	–	0.03 (0.0)
Measures						
Sexual minority stressors						
Sexual minority identity milestone age	–	–	–	–	–0.03 (0.0)	–0.02 (0.0)
Bullying victimization	–	–	–	–	0.14 (0.1)	0.15 (0.1)
Psych stress responses						
Depressive symptoms	–	–	–	–	–	0.02 (0.0)
Anxious symptoms	–	–	–	–	–	0.06 (0.0)

Table 3 (continued)

Measures	Males					
	Mostly heterosexual		Bisexual		Gay	
	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)
Sexual minority stressors						
<u>Same-gender attractions milestone age</u>	–	–	0.04 (0.0)	0.04 (0.0)	–0.04 (0.0)	0.00 (0.0)
Bullying victimization	–	–	–0.34 (0.1)	–0.30 (0.3)	0.14 (0.1)	0.17 (0.1)
Psych stress responses						
Depressive symptoms	–	–	–	0.06 (0.1)	–	0.01 (0.0)
Anxious symptoms	–	–	–	–0.00 (0.0)	–	0.06 (0.0)
Sexual minority stressors						
<u>Same-gender sexual experience milestone age</u>	–	–	–	–	–0.01 (0.0)	–0.00 (0.0)
Bullying victimization	–	–	–	–	0.11 (0.1)	0.14 (0.1)
Psych stress responses						
Depressive symptoms	–	–	–	–	–	0.01 (0.0)
Anxious symptoms	–	–	–	–	–	0.07 (0.0)

^a Significant effects are bolded. All numbers are rounded to the nearest tenth or hundredth. Results are not presented for some sexual orientation groups (e.g., mostly heterosexual males) for some sexual minority developmental milestones because the milestone age was only queried when the milestone was endorsed as having been experienced. Within some sexual orientation groups, milestones were not endorsed in high enough proportion to obtain information on milestone age resulting in a large amount of missingness (> 40 %).

^b Model 1 included sexual minority stressors (sexual minority developmental milestones and bullying victimization). Model 2 included sexual minority stressors (sexual minority developmental milestones and bullying victimization) and psychological stress responses (depressive symptoms and anxious symptoms). Models controlled for age (linear), race/ethnicity, and sexual orientation mobility.

Table 4 Disinhibited eating (Outcome) GEE linear regression coefficients^a for models^b testing the associations between sexual minority stressors and unhealthy eating behaviors and attenuation by psychological stress responses among female (N=1098) and male (N=363) youth in the growing up today study

Measures	Females					
	Mostly heterosexual		Bisexual		Lesbian	
	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)
Sexual minority stressors						
Sexual minority identity milestone age	-	-	-0.12 (0.1)	-0.10 (0.1)	-0.20 (0.1)	-0.21 (0.1)
Bullying victimization	-	-	0.85 (0.3)	0.74 (0.3)	-0.24 (0.6)	-0.62 (0.4)
Psych stress responses						
Depressive symptoms	-	-		0.03 (0.1)		-0.19 (0.1)
Anxious symptoms	-	-		0.04 (0.0)		0.17 (0.1)
Sexual minority stressors						
Same-gender attractions milestone age	-0.00 (0.0)	-0.14 (0.1)	-0.09 (0.1)	-0.06 (0.1)	-0.09 (0.1)	-0.08 (0.1)
Bullying victimization	0.50 (0.2)	1.78 (0.9)	1.01 (0.3)	0.90 (0.3)	-0.44 (0.5)	-0.76 (0.4)
Psych stress responses						
Depressive symptoms		0.25 (0.3)		0.03 (0.1)		-0.12 (0.1)
Anxious symptoms		-0.11 (0.1)		0.04 (0.0)		0.13 (0.1)
Sexual minority stressors						
Same-gender sexual experience milestone age	-	-	-	-	-0.11 (0.1)	-0.11 (0.1)
Bullying victimization	-	-	-	-	-0.45 (0.5)	-0.77 (0.4)
Psych stress responses						
Depressive symptoms	-	-	-	-	-	-0.13 (0.1)
Anxious symptoms	-	-	-	-	-	0.14 (0.1)
Males						
Measures	Mostly heterosexual		Bisexual		Gay	
	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)
Sexual minority stressors						
Sexual minority identity milestone age	-	-	-	-	-0.24 (0.1)	-0.22 (0.1)
Bullying victimization	-	-	-	-	0.30 (0.4)	0.28 (0.3)
Psych stress responses						
Depressive symptoms	-	-	-	-	-	0.04 (0.1)
Anxious symptoms	-	-	-	-	-	0.09 (0.1)

Table 4 (continued)

Measures	Males					
	Mostly heterosexual		Bisexual		Gay	
	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)
Sexual minority stressors						
Same-gender attractions milestone age	–	–	0.19 (0.1)	0.17 (0.1)	–0.08 (0.1)	–0.02 (0.1)
Bullying victimization	–	–	0.11 (0.5)	–0.35 (0.5)	0.11 (0.3)	0.12 (0.3)
Psych stress responses						
Depressive symptoms	–	–	–	–0.27 (0.2)	–	0.05 (0.1)
Anxious symptoms	–	–	–	0.06 (0.1)	–	0.09 (0.1)
Sexual minority stressors						
Same-gender sexual experience milestone age	–	–	–	–	–0.07 (0.1)	–0.05 (0.1)
Bullying victimization	–	–	–	–	0.05 (0.4)	0.07 (0.3)
Psych stress responses						
Depressive symptoms	–	–	–	–	–	0.04 (0.1)
Anxious symptoms	–	–	–	–	–	0.09 (0.1)

^a Significant effects are bolded. All numbers are rounded to the nearest tenth or hundredth. Results are not presented for some sexual orientation groups (e.g., mostly heterosexual males) for some sexual minority developmental milestones because the milestone age was only queried when the milestone was endorsed as having been experienced. Within some sexual orientation groups, milestones were not endorsed in high enough proportion to obtain information on milestone age resulting in a large amount of missingness (> 40 %).

^b Model 1 included sexual minority stressors (sexual minority developmental milestones and bullying victimization). Model 2 included sexual minority stressors (sexual minority developmental milestones and bullying victimization) and psychological stress responses (depressive symptoms and anxious symptoms). Models controlled for age (linear), race/ethnicity, and sexual orientation mobility.

behaviors. Findings from the current research suggest that these associations may differ across gender-sexual orientation groups, which, given the paucity of research in the field, is an important contribution to moving the literature forward.

Also, contrary to predictions, greater bullying victimization was related to less coping-motivated eating among lesbians and bisexual males. In other words, despite experiencing bullying victimization, lesbians and bisexual males in the current study did not respond by engaging in more coping-motivated eating. It is possible that these groups are using other mechanisms (unhealthy or healthy) to cope with this stressor. For instance, other research using data from GUTS found that compared to heterosexual males, bisexual males had a higher odds of smoking in the past month, smoking frequently, and having nicotine dependence than other sexual minority males, although the two sexual minority groups were not compared directly [48]. Perhaps, bisexual males are using smoking to cope with sexual minority stressors, rather than overeating through coping-motivated eating or disinhibited eating. More research is needed to understand a wider array of lesbian and bisexual male youths' responses to experiencing bullying victimization.

Significant associations between sexual minority stressors and unhealthy eating behaviors were partially, but not completely, explained by depressive and anxious symptoms. Our hypothesized model did not hold across gender-sexual orientation groups, suggesting subgroup level heterogeneity and providing support for an individual developmental trajectories approach to understanding the experiences of sexual minorities [49–51]. In particular, although many female and male sexual minority groups experienced the same types of stressors (earlier achievement of sexual minority developmental milestones, greater bullying victimization), there were differences in how gender-sexual orientation subgroups responded to these stressors. Clinicians working with sexual minority youths must consider the potential for variability in coping strategies used in response to minority stress.

Although anxious symptoms were associated with increased coping-motivated and disinhibited eating among some groups, in the few instances in which depressive symptoms were significantly related to the outcomes, an inverse association was found. Greater depressive symptoms were associated with less coping-motivated eating among mostly heterosexual females and less disinhibited eating among lesbians. Previous research has indicated that depression is longitudinally associated with both obesogenic and leptogenic eating behaviors [52]. Results from the current research suggest that among some sexual minority groups, depression may act to inhibit rather than increase unhealthy eating behaviors.

Previous research has indicated that sexual minorities are more likely than heterosexuals to experience internalizing symptoms, such as depression and anxiety, perhaps in response to sexual minority stressors [11–13, 16]. But, the pathway between sexual minority stressors and internalizing symptoms (depressive

and anxious symptoms) may be mediated by emotion regulation, offering an explanation for gender-sexual orientation subgroup differences. A study of adolescents found that sexual minorities had greater challenges than heterosexuals in emotion regulation, particularly regarding ruminative coping and poor emotional awareness, which mediated the relationship between sexual minority status and depressive and anxious symptoms [13]. Future research could examine emotion regulation as a mechanism in the associations among sexual minority stressors, internalizing symptoms, and unhealthy eating behaviors.

In the current study, depressive and anxious symptoms appeared to account for associations between sexual minority stressors and unhealthy eating behaviors for females more so than for males. The ABC Model of Depression, which proposes that gender differences in vulnerabilities to depression across multiple factors (affective, biological, cognitive) interact with negative life events to result in higher rates of depression among females compared to males [15], may help to explain this pattern. Perhaps, sexual minority females have greater emotional reactivity (affective factor) and engage in more ruminative coping (cognitive factor) than sexual minority males in response to sexual minority stressors, which leads to greater depression and more coping through unhealthy eating behaviors among sexual minority females compared to sexual minority males. Interestingly, depressive symptoms were not found to be significantly higher among females compared to males in the current study. These results conflict with previous research demonstrating that the gender difference in depression found in the general population is also found among sexual minority youths, with females reporting more depressive symptoms than males [16]. However, it is likely that much of research on gender differences in depression has not taken sexual orientation into account. Further exploration of pathways between sexual minority stressors and unhealthy eating behaviors for female and male sexual minorities, including consideration of biological factors (e.g., cortisol reactivity [53]), would be a fruitful direction for future research.

A number of limitations should be mentioned. First, we cannot determine causality of associations between sexual minority stressors and unhealthy eating behaviors since we were not able to randomize the exposures or measure the constructs in an ideal temporal order. Future research could measure unhealthy eating behaviors at multiple time points to investigate longitudinal associations between sexual minority stressors at baseline and unhealthy eating behaviors over time. Second, examination of coping strategies other than unhealthy eating behaviors was beyond the scope of this research. Future research could include a wider range of strategies to better understand how sexual minorities cope with stressors. Third, we had low statistical power to detect significant associations for bisexual males due to a small sample size. It may be important to oversample this group in future studies to achieve a sample size that allows for comparative analyses with other

sexual minority groups. Finally, the GUTS cohort is largely homogenous in terms of race/ethnicity. Future research could examine how sexual minority stressors are associated with unhealthy eating behaviors across multiple race/ethnicity groups. Despite the aforementioned limitations, GUTS has much to offer as a prospective national cohort of youths. This cohort offers a unique and critical opportunity to study sexual minorities who are part of a general population study, rather than being recruited based on their sexual orientation, the latter of which is typical in literature on sexual orientation health disparities.

Sexual minority stressors were found to be significantly related to unhealthy eating behaviors. In particular, our conceptual model appears to best describe the experiences of bisexual females. Psychological stress responses partially explained associations between stressors and unhealthy eating behaviors, but more research is needed to fully understand these associations. This project makes an important contribution to the literature by integrating Minority Stress Theory with the ABC Model of Depression, but more theory development is needed to provide a basis for the findings of this research, particularly as related to sexual minority subgroup heterogeneity. Associations between bullying victimization and unhealthy eating behaviors highlight the importance of developing bullying prevention programs, especially for sexual minority youths who are known to experience victimization disproportionately compared to their heterosexual peers [6]. In addition, health care and youth service providers and parents/guardians must be educated about these associations to help sexual minorities engage in healthy coping mechanisms in response to minority stress. In short, more bullying prevention programs and attention to healthy coping mechanisms will be crucial for improving the health and well-being of female and male youths across sexual orientation groups.

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