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Relationship between weight-related behavioral profiles and health outcomes by sexual orientation and gender

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Abstract

Objective—Examine relationships between weight-related factors and weight status, body dissatisfaction, chronic health conditions, and quality of life across sexual orientation and gender.

Methods—Two- and four-year college students participated in the College Student Health Survey (n=28,703; 2009-2013). Risk differences were calculated to estimate relationships between behavioral profiles and weight status, body satisfaction, diagnosis of a chronic condition, and quality of life, stratified by gender and sexual orientation. Four behavioral profiles, characterized as “healthier eating habits, more physically active,” “healthier eating habits,” “moderate eating habits,” and “unhealthy weight control,” were utilized based on latent class analyses, estimated from nine weight-related behavioral survey items.

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Disclosure

The authors disclose no conflicts of interest.

Results—Sexual orientation differences in weight and quality of life were identified. For example, sexual minority groups reported significantly poorer quality of life than their heterosexual counterparts (females: 22.5%-38.6% (sexual minority) vs. 19.8% (heterosexual); males: 14.3%-26.7% (sexual minority) vs. 11.8% (heterosexual)). Compared to the “healthier eating habits, more physically active” profile, the “unhealthy weight control” profile was associated with obesity, poor body satisfaction, and poor quality of life in multiple gender/sexual orientation subgroups.

Conclusions—Interventions are needed to address obesity, body dissatisfaction, and poor quality of life among sexual minority college students.

Keywords

sexual orientation; disparities; weight-related behaviors; obesity; health outcomes; college students

Introduction

Emerging adulthood (18-25 years of age) is when independence is generally established and new responsibilities, life skills, and identities (such as those around sexuality) are negotiated.¹ Weight-related health declines during emerging adulthood, with noted weight gain, deterioration of diet quality and physical activity, and increasing sedentary behaviors.^{2,3} Sexual minorities may experience greater chronic stress resulting from stigma and discrimination (known as minority stress)⁴ which can negatively impact weight-related health, particularly during the sensitive developmental period of emerging adulthood. During this time, we see greater risk for overweight and obesity, poor eating habits, insufficient physical activity, and disordered eating among sexual minority emerging adults.⁵⁻¹² Nearly half of emerging adults attend college,¹³ making college campuses a viable setting for interventions addressing weight-related health disparities among emerging adult sexual minorities.

Existing research indicates lesbian and bisexual adult women are more likely to be obese,¹⁴⁻²⁰ while gay adult men are less likely to be obese, compared to their heterosexual counterparts.¹⁶⁻²² However, gay and bisexual adult men are at higher risk of body dissatisfaction and disordered eating than heterosexual men.^{5,7} The burden of unhealthy weight, body dissatisfaction, and disordered eating on lesbian, gay, and bisexual (LGB) people has implications for disparities in chronic conditions (e.g., diabetes, cardiovascular disease) and health-related quality of life (QOL). Despite greater risk among LGB people, research examining sexual orientation disparities in chronic conditions and QOL is limited, thus limiting our understanding of the consequences of unhealthy weight, body dissatisfaction, and disordered eating for sexual minorities. Some studies have found lesbian and bisexual women are more likely to have type 2 diabetes^{17,23} and cardiovascular disease,¹⁸ while others found no sexual orientation differences in prevalence of diabetes, cardiovascular disease, hypertension, or hypercholesterolemia among either men or women.^{16,18,20,23-26} However, LGB adults tend to report lower QOL than heterosexuals, particularly related to frequent mental distress,^{18,24,27,28} which may have important implications for long-term health outcomes, as poor QOL is associated with increased morbidity, mortality, and healthcare use.²⁹

Among college students, previous work has documented differences in weight-related health similar to other adult populations, including unhealthy weight, more eating out, less physical activity, more disordered eating and body dissatisfaction among sexual minority students, as well as greater frequent mental distress than heterosexual students.^{5,27,30} Previously, we examined patterning of weight-related behaviors by sexual orientation and gender and identified the co-occurrence of unhealthy weight control and insufficient physical activity was disproportionately prevalent among sexual minority college students.^{31,32} However, limitations of this work include lack of examining chronic conditions, which continue to be understudied among LGB people, and no research examining the relationship of poor behavioral health and health outcomes among LGB people. In line with the minority stress model,⁴ LGB people may experience stigma and discrimination which may influence the relationship between poor behavioral health and health outcomes; understanding the implications of different weight-related behavioral patterns on health will inform development of interventions by highlighting most at-risk groups.

Building on our previous work which focused on sexual orientation differences in weight-related behaviors, the present study aimed to extend our understanding of weight-related health and sexual orientation by (1) exploring sexual orientation disparities in four outcomes: weight status, body dissatisfaction, chronic conditions, and QOL by gender and (2) examining the relationship between weight-related behavioral profiles and these four outcomes, by gender and sexual orientation.

Methods

Study population and data source

Data were from the 2009-2013 College Student Health Survey (CSHS), an on-going statewide surveillance system of 2- and 4-year colleges and universities across Minnesota. From 2009-2013, 46 institutions participated in CSHS (26 two-year and 20 four-year). For most CSHS-participating schools, students were randomly selected through registrars' enrollment lists. For smaller schools, all students were invited to participate to have sufficient sample sizes for school-specific reports, while at larger schools only a proportion of students were invited (sampling range: 12.5-100%, dependent of school size). Eligible participants were sent multiple invitations, including postcards and emails, to anonymously complete an online survey. Participants who completed the survey were entered into a raffle to win prizes such as iPods®, iPads®, and gift cards. The overall response rate was 33.2%. Details are available online (<http://www.bhs.umn.edu/surveys/index.htm>) and in previously published work.^{5,27,31,32}

Thirty of the 46 colleges participated in more than one year between 2009 and 2013. To minimize the possibility that participants were included in the dataset more than once, a college's second year of data was included only when the possibility of overlap in participants was negligible (i.e., less than 2%, calculated from sampling percentage, graduation and retention rates), similar to previous work.^{5,27,31-33} Six schools had a negligible estimated percentage of overlap in the first and second samples (range: 0.45%-1.57%). Thus, an additional year of data was included for these schools ($n_{\text{students}} = 6,912$). This yielded a final merged 2009-2013 dataset of 29,118 students (35.8% male).

Measures

Self-reported sexual orientation was assessed as identity and behavior. Consistent with research using the Youth Risk Behavior Survey (YRBS)³³ and CSHS data,^{5,27,31,32} we created categories for sexual orientation: “heterosexual” (identified as heterosexual and did not report engaging in same-sex sexual behavior in the past year), “mostly heterosexual” (identified as heterosexual and reported engaging in same-sex sexual behavior in the past year; referred to as “discordant heterosexual” in previously published work),^{5,27,31,32} “gay/lesbian,” “bisexual,” and “unsure.” Participants were in one of the last three categories based on identity only, regardless of sexual behavior.

Main exposure: weight-related behavioral profiles—Nine weight-related behaviors were used in latent class analysis (LCA) identifying homogenous behavioral patterns within the heterogeneous college population: consumption of regular soda, diet soda, fast food, restaurant food, and breakfast, participation in moderate-to-vigorous and strengthening physical activities, no unhealthy weight control behaviors, and no binge eating.^{31,32} All measures were dichotomized based on existing public health recommendations, which have practical significance regarding meaningful thresholds for health. Details on measures have been described in previous work.^{5,31,32}

Previously, we used LCA to identify homogenous weight-related profiles, stratified by sexual orientation and gender, using the nine weight-related behaviors described above. LCA is designed to identify homogenous subgroups within a larger heterogeneous group, based on responses to select indicators, making it a useful data reduction strategy.³⁴ A variety of fit statistics and interpretability of solutions were considered in selecting final models. Additional details have been previously published.^{31,32} Briefly, findings from LCA models identified four distinct profiles among both males and females, “healthier eating habits,” “moderate eating habits,” “unhealthy weight control,” and “healthier eating habits, more physically active.” Among males, slight deviations existed for some sexual orientation groups (i.e., a “healthier eating habits with breakfast consumption” and “healthier eating habits without breakfast consumption” profile were identified among gay men and “moderate eating habits with regular soda consumption” was identified for unsure men); however, general patterns were consistent with those identified among females. Further, among mostly heterosexual and bisexual males, a “healthier eating habits, more physically active” profile was not identified, suggesting not enough engaged in sufficient physical activity to extract this class. No other profiles were identified in these groups.

Outcome: weight status—Body mass index (BMI), calculated using self-reported height and weight, was used to categorize *weight status* as: underweight/normal weight (<25.0 kg/m²), overweight (25.0-29.9 kg/m²) and obese (≥ 30.0 kg/m²).

Outcome: body dissatisfaction—One item assessed overall body satisfaction, “During the past 30 days, I felt satisfied with my body image/size.”¹⁵ Response options included, “never,” “sometimes,” “most of the time,” and “always.” Consistent with previous work, participants reporting “never” or “sometimes” were considered to have *body dissatisfaction*.

Outcome: chronic conditions—Health diagnoses of three chronic conditions were assessed by asking, “For each condition, indicate whether you have been diagnosed within the past 12 months”: diabetes (Type II), high cholesterol, and high blood pressure (yes/no for each). Due to small sample sizes, a measure of *any health diagnosis* was created for respondents who indicated any of the three diagnoses.

Outcome: QOL—Health-related QOL was assessed using an adaptation of a validated set of measures used in national surveillance (CDC HRQOL-4).²⁹ Two items from this scale were used. The first asked, “Thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?” The second asked, “Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Consistent with previous research, participants indicating 14+ days were considered to have poor physical or mental health, respectively.²⁹ We combined both variables into a *poor QOL* measure, including participants with any poor physical or mental health.

Covariates—Sociodemographic covariates in these analyses included school type (2-year vs. 4-year), age, race/ethnicity (white vs. non-white), and parental educational attainment (college degree or higher vs. less than a college degree).

Analysis

Participants missing data for sexual orientation (n=85) or gender (n=43), those currently pregnant (n=255), and transgender participants (n=58) were excluded. The analytic sample was 28,703 (male: 36.3%; female: 63.7%). Previously, we identified weight-related behavioral profiles across sexual orientation and gender;^{31,32} for these analyses, we assigned individuals to their most likely class based on posterior probabilities of latent class membership and used that class assignment in subsequent analyses.³⁵

To assess sexual orientation differences across profiles and health outcomes (weight status, body dissatisfaction, diagnosis of a chronic condition, QOL), Wald chi-square tests were used. We conducted sensitivity analyses examining sexual behavior differences across health outcomes (data not shown). Results were similar for heterosexual compared with opposite-sex behavior only, gay/lesbian compared with same-sex only, and bisexual compared with both-sex behavior. This overall similarity implied that results were robust whether analyses were conducted by identity or behavior.

Crude and multivariate risk difference models were fit to assess relationships between weight-related profiles and health outcomes (adjusted for all covariates, also including weight status for body dissatisfaction models). The healthiest profile identified for each sexual orientation and gender group was the reference (i.e., “healthier eating habits, more physically active” for all female sexual orientation groups and for heterosexual, gay, and unsure males; “healthier eating habits” for mostly heterosexual and bisexual men). We tested the moderating effect of sexual orientation on the relationship between behavioral profiles and health outcomes, which was largely not significant. All analyses were stratified by gender and accounted for school-based cluster. LCA were conducted using SAS (SAS

version 9.4, Cary, NC: SAS Institute Inc.) as described in previous work.^{31,32} All other analyses were conducted using STATA (STATA version 11, College Station, TX: StataCorp). These secondary analyses were exempt from IRB review. The University of Minnesota Institutional Review Board approved all CSHS data collection.

Results

The overall sample was predominantly heterosexual (92.4%), 0.8% were mostly heterosexual, 2.0% were gay/lesbian, 3.0% were bisexual, and 1.9% were unsure of their sexuality. The majority of participants attended a 4-year school (63.2%), were white (81.5%), and the median age was 22 years.

Table 1 contains the prevalence of weight-related profiles identified from previous work^{31,32} based on most likely class assignment by sexual orientation. Overall, “healthier eating habits” was the most prevalent profile across sexual orientation and gender (range among females: 40.9%-66.0%; males: 44.0%-74.3%), followed by “moderate eating habits” (range among females: 14.0%-29.3%; males: 17.0%-26.1%). “Unhealthy weight control” was notably high among sexual minority students compared to heterosexual (range: 8.9%-17.0% vs. 5.7% for heterosexual females; range: 6.2%-25.7% vs. 2.0% for heterosexual males). The healthiest class was the “healthier eating habits, more physically active,” which ranged from 8.9%-20.9% among females and 9.2%-37.0% among males. This class was not identified for mostly heterosexual or bisexual males.

Table 2 includes the prevalence of weight status, body dissatisfaction, chronic conditions, and QOL outcomes by sexual orientation. We found significant sexual orientation differences in weight status and QOL among both males and females. Notably, sexual minority males and females generally reported significantly poorer QOL than their heterosexual counterparts (females: 22.5%-38.6% vs. 19.8%; males: 14.3%-26.7% vs. 11.8%), with bisexual females and males having the highest prevalence of poor QOL. Among males only, we found significant differences in body dissatisfaction and type 2 diabetes diagnosis, however, given small sample sizes for diabetes, this finding should be interpreted with caution.

Adjusted risk differences in the relationship between weight-related behavioral profiles and health outcomes across sexual orientation groups among females and males are presented in tables 3 and 4, respectively. The healthiest weight-related behavioral profile is the reference within each sexual orientation group and adjusted prevalence is presented as the reference. Other values are relative to this reference group's adjusted prevalence. Among heterosexual females, exhibiting “healthier eating habits,” “moderate eating habits,” and “unhealthy weight control” profiles was significantly associated with a 5-16% higher risk of obesity compared to the “healthier eating habits, more physically active” profile (i.e., the healthiest category). Additionally, “moderate eating habits” and “unhealthy weight control” profiles were significantly associated with body dissatisfaction, any health diagnosis, and poor QOL. Sexual minority females exhibiting the “unhealthy weight control” profile showed several significant differences in outcomes compared to those in the “healthier eating habits, more physically active” class. (See Table 3.)

Among sexual minority females, the “healthier eating habits, more physically active” profile had the lowest risk of overweight or obesity and poor QOL than any other class, although these findings were not statistically significant. Bisexual females exhibiting “moderate eating habits” and “unhealthy weight control” profiles had more than three times the risk of any health diagnosis than the “healthier eating habits, more physically active” profile.

Among heterosexual males, the “healthier eating habits, more physically active” profile had the lowest risk of obesity, body dissatisfaction, and poor QOL of all profiles. Exhibiting the “unhealthy weight control” profile was significantly associated with a lower likelihood of being underweight/normal weight than the “healthier eating habits, more physically active” profile. Among sexual minority males, exhibiting the “unhealthy weight control” profile was significantly associated with body dissatisfaction compared to the healthiest profiles. Additional significant differences in outcomes across profiles are noted in Table 4.

Several notable differences, although not statistically significant, existed among smaller sexual orientation subgroups. Among mostly heterosexual and bisexual males, the “unhealthy weight control” profile had 2-3 times the risk of obesity than the “healthier eating habits” profile. Similarly among gay men, compared to the “healthier eating habits, physically active” profile, the “unhealthy weight control” profile had double the risk of overweight, while the “healthier eating habits with breakfast” profile had double the risk of any health diagnosis, and the “healthier eating habits without breakfast” profile had double the risk of poor QOL.

Discussion

Overall, we identified disparities by sexual orientation and gender, most notably in weight status and QOL, with greater obesity among lesbian and bisexual female students, more overweight among heterosexual male students, and poorer QOL among sexual minority females and males. These findings are consistent with previous research.^{14-22,24,27,28} Interestingly, while we found significant differences in body dissatisfaction among males by sexual orientation, similar to other work,^{5,36} we found no differences in body dissatisfaction among females, which is inconsistent with previous research.^{5,36,37} We generally did not find sexual orientation disparities in the prevalence of health diagnoses, perhaps due to a younger sample and low prevalence.

Most notably, we found that the association between weight-related behaviors and health outcomes were generally similar across sexual orientation groups. This finding, in line with the minority stress model, suggests that other factors, such as social stressors, stigma, or discrimination related to one's sexual minority status, may be highly salient in explaining these weight-related health disparities. Exploring these factors and how they are associated with weight-related behaviors is critical for developing interventions addressing sexual orientation health disparities. For example, understanding minority stress factors that are positively associated with more unhealthy weight control among sexual minority college students may help prevent engaging in those behaviors.

Findings continue to emphasize the importance of sexual orientation and gender-related disparities in the prevalence of weight-related behaviors and health outcomes. The disproportionate burden of the “unhealthy weight control” profile among sexual minority college students has implications for long-term health, particularly regarding weight status, body dissatisfaction, and poor QOL (which we found greater risk for among students exhibiting “unhealthy weight control”). Improving QOL is a national health goal of Healthy People 2020 and particularly important for LGB health.³⁸ Overall, our findings highlight the need for interventions targeting multiple health-related risk behaviors, such as physical activity and unhealthy weight control, on college campuses, particularly among sexual minority students, to promote healthy behaviors that reduce sexual orientation disparities in weight-related health. Further, physical activity needs to be promoted on college campuses among all students, as profiles not exhibiting physical activity engagement were less healthy.

Several unexpected findings (including significant associations and non-significant trends) emerged for those unsure about their sexual orientation. Consistent with previous research, there are important considerations in interpretation of results for this group.^{5,27} Students reporting ‘unsure’ sexual identities represent a more racially and ethnically diverse group who were generally younger and more likely to be international students than other sexual orientation groups. Sexual identity labels are socio-culturally specific and terms used in this study (i.e., heterosexual, gay or lesbian, and bisexual) do not represent the diversity of identities, particularly among marginalized communities and those from other countries.³⁹ Therefore, some sexual orientation misidentification may exist among students identifying as ‘unsure’ in this study.

To our knowledge, this is the first study to examine relationships between weight-related behaviors and weight-related outcomes by sexual orientation. This study highlights the complexities surrounding weight-related health.⁴⁰ One unique aspect of this study is using LCA to characterize weight-related behaviors, which potentially provides a more realistic picture of behavioral health among college students across sexual orientation. For example, while in existing work each behavior (e.g., unhealthy weight control, physical activity) has been independently associated with particular health outcomes, our study shows that both unhealthy weight control and physical inactivity frequently co-occur to collectively have an adverse impact on health. As a corollary, physical activity co-occurs with other healthful habits (e.g., healthier eating, no disordered eating), which all contribute to better health outcomes. These findings help inform the development of future interventions which should address multiple weight-related behaviors.

Our study has several limitations. First, it was cross-sectional, therefore, temporality and causality cannot be determined. Further, our sample was young; therefore, the prevalence of chronic conditions was low and limited our ability to examine conditions common among older adults, like diabetes. Despite this, notable findings regarding higher prevalence, particularly for the “unhealthy weight control” profile suggest the need for more longitudinal research to understand long-term health implications on chronic conditions of obesity and disordered eating that disproportionately impact the LGB community. For sexual minority groups, many results were in similar directions, although not statistically significantly different from the heterosexual group. Non-significance could be due to small sample sizes

or other factors experienced by sexual minorities, such as discrimination or stigma, which adversely impact health,⁴ but were not examined in these analyses. Future research should examine issues of discrimination and stigma as it relates to weight-related health among sexual minority populations. Further, larger sample sizes are needed for sexual orientation groups such as mostly heterosexual, bisexual, and unsure, who appear to also be disproportionately affected by poor health. Our sample of college students is from a specific geographic region of the US which is predominantly white and thus our sample has limited racial diversity, limiting generalizability of findings to other populations and communities of color. Additionally, due to small sample sizes (n=58), transgender students were excluded from analyses. There is an urgent need for research on transgender health, and it is critical future work examine these health issues for transgender populations. Larger sample sizes would also facilitate more detailed assessment of certain variables, such as body dissatisfaction (which was dichotomized in these analyses and thus was limited in its ability to capture variability) and weight status (for which we collapsed underweight and normal weight categories due to a small prevalence across some—but not all—sexual orientations groups). Finally the response rate for the survey sample was 33.2%; although this response rate is in line with similar surveys, it could potentially introduce bias.

Conclusion

Overall, findings continue to highlight disparities in weight-related health among sexual minority college students. Disparities in weight-related health are particularly important among college students who engage in unhealthy weight control behaviors as well as insufficient physical activity, a set of behaviors that disproportionately affect sexual minority students.⁵ Further, our finding regarding poor QOL among sexual minority college students also makes these issues particularly relevant to college health; developing interventions to improve QOL by creating LGB inclusive safe spaces such as for health services and recreation centers may be needed to ensure a successful and supportive campus climate. Further, the presence of these disparities at young ages highlights the need to utilize college settings for delivery of comprehensive social and health interventions, including promoting healthy weight behaviors, for sexual minority students.

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What is already known about this subject?

- Lesbian and bisexual adult women are more likely to be obese, while gay adult men are less likely to be obese, than their heterosexual counterparts. Gay adult men are at higher risk of body dissatisfaction and disordered eating than heterosexual men.
- Findings for relationships between sexual orientation and chronic health outcomes such as type 2 diabetes, cardiovascular disease, high blood pressure, and high cholesterol have been limited and mixed. However, lesbian, gay, and bisexual adults tend to report lower health-related quality of life than heterosexuals.

What does this study add?

- Our findings illustrate the disproportionate burden of chronic conditions, body dissatisfaction, and poor quality of life among sexual minority individuals who exhibit poor behavioral health profiles, thus highlighting the need for effective interventions that promote healthy weight behaviors among these underserved groups.

Prevalence of weight-related behavioral profiles by sexual orientation based on assignment to highest probability of class membership from unconditional LCA models,^a stratified by gender^{33,34}

Table 1

	Female					p-value ^b
	Heterosexual (n=16,891)	Mostly heterosexual (n=147)	Lesbian (n=225)	Bisexual (n=677)	Unsure (n=357)	
Healthier eating habits, more physically active	1,706 (10.1%)	17 (11.6%)	47 (20.9%)	60 (8.9%)	61 (17.1%)	<0.001
Healthier eating habits	11,142 (66.0%)	74 (50.3%)	92 (40.9%)	384 (56.7%)	204 (54.1%)	<0.001
Moderate eating habits	3,076 (18.2%)	31 (21.1%)	66 (29.3%)	126 (18.6%)	50 (14.0%)	0.01
Unhealthy weight control	967 (5.7%)	25 (17.0%)	20 (8.9%)	107 (15.8%)	42 (11.8%)	<0.001
	Male					p-value ^b
	Heterosexual (n=9,660)	Mostly heterosexual (n=70)	Gay (n=337)	Bisexual (n=161)	Unsure (n=178)	
Healthier eating habits, more physically active	3,575 (37.0%)	N/A	31 (9.2%)	N/A	17 (9.6%)	<0.001
Healthier eating habits	4,246 (44.0%)	52 (74.3%)	N/A	108 (67.1%)	124 (69.7%)	<0.001
Healthier eating habits with breakfast consumption	N/A	N/A	128 (38.0%)	N/A	N/A	N/E
Healthier eating habits without breakfast consumption	N/A	N/A	157 (46.6%)	N/A	N/A	N/E
Moderate eating habits	1,643 (17.0%)	N/A	N/A	42 (26.1%)	N/A	0.01
Moderate eating habits with regular soda consumption	N/A	N/A	N/A	N/A	20 (11.2%)	N/E
Unhealthy weight control	195 (2.0%)	18 (25.7%)	21 (6.2%)	11 (6.8%)	17 (9.6%)	<0.001

N/A: Specified class was not identified for this sexual orientation group. Based on the best fitting model selected for each sexual orientation group, among gay males, there were two deviations identified from the “healthier eating habits” profile: “healthier eating habits with breakfast consumption” and “healthier eating habits without breakfast consumption.” Among unsure males, there was one deviation, “moderate eating habits with regular soda consumption.” Despite these deviations, the general profiles identified largely fall under four common profiles described.

Further, among mostly heterosexual and bisexual males, not all four profiles or any deviations were identified.

N/E: Not estimated due to identification of this weight-related behavior profile in only one sexual orientation group

^aNine weight-related behaviors were used in LCAs to identify homogenous patterns of behaviors within the heterogeneous college population: consumption of regular soda, diet soda, fast food, restaurant food, and breakfast, and participation in moderate-to-vigorous and strengthening physical activities, no unhealthy weight control behaviors, and no binge eating

^bcalculated from Wald chi-square tests, adjusted for school-based clustering

Table 2

Prevalence of weight status, poor body satisfaction, chronic conditions, and quality of life by sexual orientation, stratified by gender

Variable	Females (n=18,297)					p-value ^a
	Heterosexual (n=16,891)	Mostly heterosexual (n=147)	Gay/lesbian (n=225)	Bisexual (n=677)	Unsure (n=357)	
Weight Status						<0.001
Underweight/Normal weight	10,126 (60.2%)	84 (57.1%)	105 (46.7%)	349 (51.7%)	220 (62.7%)	
Overweight	3,721 (22.1%)	39 (26.5%)	53 (23.6%)	168 (24.9%)	66 (18.8%)	
Obese	2,974 (17.7%)	24 (16.3%)	67 (29.8%)	158 (23.4%)	65 (18.5%)	
Body dissatisfaction	10,121 (59.9%)	89 (60.5%)	135 (60.0%)	432 (63.8%)	214 (59.9%)	0.39
Health Diagnoses						
Diabetes	69 (0.4%)	0 (0.0%)	1 (0.5%)	3 (0.5%)	1 (0.3%)	0.95
High blood pressure	394 (2.4%)	3 (2.1%)	9 (4.1%)	14 (2.1%)	8 (2.4%)	0.56
High cholesterol	398 (2.5%)	3 (2.1%)	8 (3.7%)	11 (1.7%)	10 (3.0%)	0.47
Any health diagnosis	703 (4.3%)	5 (3.6%)	14 (6.4%)	24 (3.7%)	15 (4.5%)	0.52
Quality of Life						
Poor physical health (14+ days)	1,144 (6.8%)	5 (3.4%)	18 (8.0%)	71 (10.5%)	34 (9.5%)	<0.001
Poor mental health (14+ days)	2,758 (16.3%)	33 (22.5%)	54 (24.0%)	236 (34.9%)	84 (23.5%)	<0.001
Poor quality of life^b	3,334 (19.8%)	33 (22.5%)	64 (28.4%)	261 (38.6%)	99 (27.7%)	<0.001
Males (n=10,406)						
Variable	Heterosexual (n=9,660)	Mostly heterosexual (n=70)	Gay (n=337)	Bisexual (n=161)	Unsure (n=178)	p-value ^a
Weight Status						0.03
Underweight/Normal weight	4,918 (51.1%)	40 (57.1%)	191 (56.9%)	84 (52.8%)	105 (59.7%)	
Overweight	3,045 (31.6%)	15 (21.4%)	82 (24.4%)	46 (28.9%)	41 (23.3%)	
Obese	1,664 (17.3%)	15 (21.4%)	63 (18.8%)	29 (18.2%)	30 (17.1%)	
Body dissatisfaction	3,453 (35.8%)	38 (54.3%)	195 (57.9%)	84 (52.2%)	92 (51.7%)	<0.001
Health Diagnoses						

Variable	Females (n=18,297)					p-value ^a
	Heterosexual (n=16,891)	Mostly heterosexual (n=147)	Gay/lesbian (n=225)	Bisexual (n=677)	Unsure (n=357)	
Diabetes	51 (0.6%)	2 (3.0%)	2 (0.6%)	1 (0.7%)	3 (1.8%)	0.03
High blood pressure	318 (3.4%)	1 (1.5%)	13 (4.0%)	7 (4.5%)	7 (4.1%)	0.78
High cholesterol	270 (2.9%)	4 (6.1%)	14 (4.3%)	5 (3.2%)	2 (1.2%)	0.18
Any health diagnosis	486 (5.2%)	5 (7.6%)	21 (6.4%)	10 (6.5%)	8 (4.7%)	0.71
Quality of Life						
Poor physical health (14+ days)	453 (4.5%)	5 (7.1%)	11 (3.3%)	14 (8.7%)	14 (7.9%)	0.01
Poor mental health (14+ days)	912 (9.4%)	8 (11.4%)	60 (17.8%)	37 (23.0%)	29 (16.3%)	<0.001
Poor quality of life^b	1,141 (11.8%)	10 (14.3%)	64 (19.0%)	43 (26.7%)	35 (19.7%)	<0.001

^a calculated from Wald chi-square

^b includes reporting either poor physical health or poor mental health

Table 3

Adjusted^a risk difference^b of weight status, poor body satisfaction, chronic conditions, and quality of life across weight-related behavioral profiles^c by sexual orientation, females only (n=18,297)

	Healthier eating habits, more physically active ^d (reference)	Healthier eating habits	Moderate eating habits	Unhealthy weight control
Heterosexual (n=16,891)				
Weight status				
Underweight/Normal weight	66.1%	−3.4%	−12.4%	−16.8%
Overweight	23.9%	−2.2%	−2.2%	+0.9%
Obese	10.0%	+5.6%	+14.6%	+16.0%
Body dissatisfaction^e	56.2%	+0.3%	+9.2%	+32.7%
Any health diagnosis	3.9%	0.0%	+1.6%	+2.0%
Poor quality of life	16.7%	+0.3%	+9.1%	+19.7%
Mostly heterosexual (n=147)				
Weight status				
Underweight/Normal weight	71.0%	−10.3%	−27.3%	−17.0%
Overweight	18.1%	+4.5%	+13.5%	+17.8%
Obese	10.9%	+5.8%	+13.8%	−0.9%
Body dissatisfaction^e	68.5%	−9.1%	−12.3%	−0.2%
Any health diagnosis	10.0%	−4.0%	+4.3%	N/E
Poor quality of life	11.1%	+11.5%	+12.8%	+12.8%
Gay/Lesbian (n=225)				
Weight status				
Underweight/Normal weight	59.7%	−11.8%	−14.1%	−34.1%
Overweight	19.1%	+3.3%	+4.9%	+20.7%
Obese	21.2%	+8.5%	+9.2%	+13.4%
Body dissatisfaction^e	47.5%	+12.3%	+14.0%	+34.6%
Any health diagnosis	6.6%	+0.2%	−1.7%	+0.8%
Poor quality of life	20.8%	+8.0%	+12.9%	+4.9%
Bisexual (n=677)				
Weight status				
Underweight/Normal weight	54.6%	+0.4%	−6.5%	−10.9%
Overweight	28.5%	−3.9%	−4.1%	−3.7%
Obese	16.9%	+3.5%	+10.6%	+14.5%
Body dissatisfaction^e	57.5%	+0.2%	+8.7%	+29.9%
Any health diagnosis	2.0%	−0.5%	+5.2%	+5.2%
Poor quality of life	36.7%	−5.6%	+7.4%	+17.9%
Unsure (n=357)				
Weight status				

	Healthier eating habits, more physically active ^d (reference)	Healthier eating habits	Moderate eating habits	Unhealthy weight control
Underweight/Normal weight	60.7%	+2.5%	−3.1%	7.3%
Overweight	24.5%	−7.4%	−8.7%	−4.1%
Obese	14.8%	+4.9%	+11.8%	−3.2%
Body dissatisfaction^e	53.1%	0.0%	+12.4%	+29.8%
Any health diagnosis	N/E	N/E	N/E	N/E
Poor quality of life	24.3%	+3.7%	+4.9%	+6.8%

N/E: Not estimated due to small sample size

Boldface indicates statistical significance at $p < 0.05$

^a Adjusted for school type, age, race, parental educational attainment, and relationship status

^b Risk difference compared to “healthier eating habits, more physically active” profile

^c Weight-related behavioral profiles were developed in previously published work²⁹ using latent class analysis of nine weight-related survey items

^d Adjusted prevalence; reference group is the healthiest profile identified for each sexual orientation group (percentages are relative to the reference group, for example, among heterosexual females, 15.6% of those in the “healthier eating habits” profile were obese compared to 10% in the “healthier eating habits, more physically activity profile”)

^e Adjusted for weight status, school type, age, race, parental educational attainment, and relationship status

Table 4

Adjusted^a risk difference^b of weight status, poor body satisfaction, chronic conditions, and quality of life across weight-related behavioral profiles^c by sexual orientation, males only (n=10,406)

Heterosexual (n=9,660)				
	Healthier eating habits, more physically active ^d	Healthier eating habits	Moderate eating habits	Unhealthy weight control
Weight status				
Underweight/Normal weight	51.7%	+0.1%	-1.3%	-12.8%
Overweight	34.6%	-4.7%	-4.6%	+0.8%
Obese	13.7%	+4.6%	+5.9%	+12.0%
Body dissatisfaction ^e	26.1%	+12.8%	+18.3%	+36.4%
Any health diagnosis	4.9%	-0.3%	+2.6%	0.0%
Poor quality of life	8.8%	+3.2%	+6.1%	+17.0%
Mostly heterosexual (n=70)				
		Healthier eating habits ^c		Unhealthy weight control
Weight status				
Underweight/Normal weight	--	60.7%	--	-10.4%
Overweight	--	23.6%	--	-6.9%
Obese	--	15.8%	--	+17.4%
Body dissatisfaction ^e	--	43.5%	--	+39.2%
Any health diagnosis	--	N/E	--	N/E
Poor quality of life	--	12.7%	--	+1.7%
Gay (n=337)				
	Healthier eating habits, more physically active ^d	Healthier eating habits with breakfast	Healthier eating habits without breakfast	Unhealthy weight control
Weight status				
Underweight/Normal weight	74.9%	-13.8%	-21.4%	-50.0%
Overweight	19.7%	+2.2%	+8.0%	+21.1%
Obese	5.4%	+11.5%	+13.4%	+29.0%
Body dissatisfaction ^e	48.1%	+0.8%	+15.7%	+36.4%
Any health diagnosis	3.3%	+6.6%	-0.5%	+13.7%
Poor quality of life	6.8%	+8.8%	+13.0%	+45.9%
Bisexual (n=161)				
		Healthier eating habits ^d	Moderate eating habits	Unhealthy weight control

Heterosexual (n=9,660)				
	Healthier eating habits, more physically active ^d	Healthier eating habits	Moderate eating habits	Unhealthy weight control
Weight status				
Underweight/Normal weight	--	60.6%	-25.5%	-20.6%
Overweight	--	28.6%	+3.7%	+3.4%
Obese	--	10.8%	+21.8%	+17.2%
Body dissatisfaction^e	--	53.1%	-5.7%	+19.4%
Any health diagnosis	--	4.7%	+1.3%	N/E
Poor quality of life	--	27.8%	-2.5%	-14.3%
Unsure (n=178)				
	Healthier eating habits, more physically active ^d	Healthier eating habits	Moderate eating habits with regular soda	Unhealthy weight control
Weight status				
Underweight/Normal weight	44.9%	+17.2%	+25.8%	+15.8%
Overweight	40.6%	-21.8%	-29.8%	-1.3%
Obese	14.5%	+4.6%	+4.0%	N/E
Body dissatisfaction^e	60.5%	-7.7%	-6.7%	-30.6%
Any health diagnosis	15.3%	-9.7%	N/E	N/E
Poor quality of life	18.3%	+2.2%	+7.2%	-12.8%

N/E: Not estimated due to small sample size

Boldface indicates statistical significance at $p < 0.05$

^a Adjusted for school type, age, race, parental educational attainment, and relationship status

^b Risk difference compared to the healthiest profile that was identified: "healthier eating habits, more physically active" for heterosexual, gay, and unsure men; "healthier eating habits" for mostly heterosexual and bisexual men

^c Weight-related behavioral profiles were developed in previously published work³⁰ using latent class analysis of nine weight-related survey items

^d Adjusted prevalence; reference group is the healthiest profile identified for each sexual orientation group (percentages are relative to the reference group, for example, among heterosexual males, 18.3% of those in the "healthier eating habits" profile were obese compared to 13.7% in the "healthier eating habits, more physically activity profile")

^e Adjusted for weight status, school type, age, race, parental educational attainment, and relationship status