Sexual Orientation Differences in Experiences of Discrimination and Markers of Cardiometabolic Health Among Women

SEXUAL ORIENTATION DIFFERENCES IN EXPERIENCES OF DISCRIMINATION AND MARKERS OF CARDIOMETABOLIC HEALTH AMONG WOMEN

A Thesis Presented

by

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ABSTRACT

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Queer populations (including those who identify as lesbian, gay, or bisexual) experience more negative health outcomes than straight populations. This study aims to assess sexual orientation differences in experiences of discrimination and association with markers of cardiometabolic health. Data from the Pioneer Valley Stress Study pilot (2023-2024) were used (N=161 survey participants and N=38 participants who completed study visits). Discrimination was measured using the Everyday Discrimination Scale (including discrimination frequency, situation, and chronicity) and Daily Heterosexist Experiences Questionnaire (including occurrence and distress) while cardiometabolic indicators included cholesterol, waist circumference, waist-hip ratio, BMI, percent body fat, blood pressure, fasting blood glucose, triglycerides, BMI, and resting heart rate. Linear regression models were fit to assess the association between discrimination and cardiometabolic health. Significant differences in EDS situation and frequency scores between queer and heterosexual using clinically significant cut-points of cardiometabolic health markers study participants emerged. Overall, we did not find statistically significant differences in the association between discrimination and cardiometabolic health with the exception of fasting blood glucose. In crude models, higher EDS frequency and situation scores were associated with higher levels of fasting blood glucose (β=0.542, P=0.036, and β=2.06, P=0.003 respectively) among queer participants only. In adjusted models, this association persisted for EDS situation scores (β=2.279, P=0.003). Follow-up is needed to understand how discrimination may be associated with long-term cardiometabolic health.

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CHAPTER 1

INTRODUCTION

The ways in which people may face adversity in their daily lives can accumulate over time and are generally referred to as chronic stress. Sources of chronic stress can include re-occurring daily challenges as well as less frequent traumatic events.[1] Exposure to chronic stress can lead to a variety of negative mental and physical health outcomes, such as asthma, arthritis, substance use disorders and mood disorders.[1–4]

Chronic stressors are outlined in the Minority Stress Model, which posits that exposure to sexual minority stigma and discrimination contributes to observed inequities in queer health.[1] There are several proposed processes that interact to form a type of chronic stress unique to queer populations.[1] First, external forces play a role in this stress, and may include harassment, prejudice, or other forms of adversity as a result of one's minority status.[1] These forces can occur in the short or long term.[1] These external stressors at the societal level are referred to as "distal stress processes".[1,5] In addition, these experiences may cause individuals to feel on edge even during times where they are not actively experiencing these stressors, but just anticipating that they may be rejected or discriminated against at any moment.[1] Lastly, queer populations may also internalize heterosexism, which is the term used to describe negative societal beliefs and pressures toward queerness.[1,6] Internalizing these beliefs and attitudes can lead to low self-esteem and psychological distress.[1,6]

The potential health impacts of chronic stress experiences due to discrimination as explained by the minority stress model are numerous.[1] Much of current research is

focused on the negative mental health impacts of discrimination and internalized heterosexism, rather than the physical health impacts of these experiences.[5,7,8] Many physical health conditions disproportionately impact queer populations, but it is unclear the contribution of sexual minority stress to these disparities.[9]

Research has consistently identified higher prevalence of obesity among queer women than straight women.[10] Other related cardiometabolic conditions, such as hyperglycemia or hypertension, have been less explored. An array of different cardiometabolic conditions that co-occur in an individual is characterized as metabolic syndrome, which greatly increases risk of type 2 diabetes (T2D) and cardiovascular disease (CVD).[11] However, existing research on cardiometabolic health disparities by sexual orientation has focused on specific conditions rather than a more comprehensive picture. A 2017 systematic review by Caceres et al. examined a variety of cardiometabolic health indicators such as hypertension, overweight status, and cholesterol.[12] Authors highlighted inconsistences in findings, with some studies showing a decreased risk for queer women, some showing no difference, and others showing an increased risk.[12] As noted in this article, limitations in many of these studies, as well as differences in self-reported versus measured indicators, may have had an impact on these results.[12] In addition, in 2018, Corliss et al., using data from the Nurses' Health Study II (NHSII) cohort, found that lesbian and bisexual women were 2.44 (95% CI 1.54-3.86) times more likely to develop T2D before age 40 than heterosexual women, further indicating major health disparities between these groups.[13]

Research examining metabolic syndrome, which provides a more comprehensive assessment of cardiovascular disease risk, among queer women is similarly mixed. In

2016, Kinsky et al. used data from the Epidemiologic Study of Health Risk in Women (ESTHER), a longitudinal cohort study of over 1,000 women in Pittsburgh, PA, to assess whether queer women were at higher risk for metabolic syndrome.[14] Participants, recruited from ads, queer-focused events, and other channels, were aged 35-65 and mainly White, and participated in two study visits which included blood tests, surveys and an iDXA scan.[14] To be considered as having metabolic syndrome, participants must have met three of the following criteria from the National Cholesterol Education Program's 2004 metabolic syndrome guidelines: fasting blood glucose levels of greater than or equal to 100 mg/dL or current diabetes treatment; triglycerides greater than or equal to 150 mg/dL; blood pressure greater than or equal to 130/85 or current hypertension treatment; a waist circumference of greater than or equal to 88 cm; and HDL cholesterol less than 50 mg/dL or current high cholesterol treatment.[14] Findings indicated that queer women had more individual indicators of metabolic syndrome, notably waist circumference, blood pressure and fasting glucose, as well as higher risk of the syndrome itself (adjusted risk ratio [aRR] 1.44, 95% CI 1.03–1.99).[14]

However, another study by Choi et al. using data from the 2001-2016 waves of the National Health and Nutrition Survey (NHANES), among n=12,755 women aged 20-60, found no increased risk of metabolic syndrome by sexual orientation (OR 1.29, 95% CI 0.99 1.68).[15] Participants must have met three of the criteria put forth by the National Heart, Lung, and Blood Institute: fasting blood glucose levels of greater than or equal to 100 mg/dL, HbA1c levels of 6.5% or greater, or current diabetes treatment; triglycerides greater than or equal to 150 mg/dL or current high triglycerides treatment; blood pressure greater than or equal to 130/85 or current hypertension treatment; a waist circumference

of greater than or equal to 88 cm, and HDL cholesterol less than 50 mg/dL or current high cholesterol treatment.[15] They did, however, find increased odds of having individual markers of metabolic syndrome among queer women, namely obesity and increased waist circumference.[15] These different results may have been due to the differences in age range examined in the two studies, as participants in the ESTHER study were older and more likely to have developed metabolic syndrome. Additionally, sampling differences likely contributed to differences as well, as NHANES is population-based while ESTHER was a convenience sample. Finally slight differences in the definition of metabolic syndrome may contribute to disparate findings.[14,15] Consistent between these studies, though, is that queer women had more of the individual markers of the syndrome than heterosexual women.[14,15]

An important missing link in understanding sexual orientation-based physical health disparities is the notable lack of data on sexual minority stress. To date, there is no study that examines experiences of discrimination and their relationship to metabolic syndrome and other markers of cardiometabolic health. We identified one 2017 study by Mason et al., that examined the relationship between discrimination, eating patterns, and weight.[16] This study assessed whether participants had experienced discrimination using the Everyday Discrimination Scale and if they had social support from family and friends, as well as any unhealthy eating behaviors (including overeating, losing control over their eating, and binge eating).[16] They found that experiences of discrimination were associated with unhealthy eating behaviors; however, this study only examined these factors among lesbians, not comparing to any other sexual orientation group.[16]

In light of the limitations of the current research available on cardiometabolic health and its relationship with experiences of discrimination, this study aims to better understand how experiences of heterosexist discrimination are associated with markers of cardiometabolic health (including metabolic syndrome). This study aims to better understand relationships between experiences of heterosexist discrimination and markers of cardiometabolic health in young people.

CHAPTER 2

METHODS

Data from the Pioneer Valley Stress Study (PVSS) were collected in 2023 and 2024. Recruitment for the study took place across the Pioneer Valley, particularly in areas close to the UMass Amherst campus, and included flyers and newsletters. Study participants were between 18 and 40 years old, assigned female at birth, and had no prior diagnoses of type 1 or type 2 diabetes. Participants were excluded if they were currently pregnant or if they had any history of using testosterone or other gender transition hormone therapy. Participants completed an online survey administered via REDCap and were then contacted by study staff for in-person study visits, which took place in the Center for Health and Human Performance on the UMass Amherst campus. All study procedures were approved by the University of Massachusetts Amherst Institutional Review Board.

i. Sexual Orientation

All participants (N=161) were asked to self-report their sexual orientation using the question, “Of the following options, which one best describes you?” with the option to select “gay or lesbian,” “bisexual,” or “straight” as options. Queer participants were defined as those who answered that “gay or lesbian” or “bisexual” best defines them, while straight participants were defined as those who reported that “straight” best defines them.

ii. Discriminatory experiences

The Everyday Discrimination Scale is a validated questionnaire which was originally adapted to examine differences in discriminatory experiences faced by Black Americans

when compared with White Americans.[17–20] Its use has expanded over the years, and today it is commonly used to assess subjective experiences of discrimination by people with many different identities, including queer individuals.[16,20] It lists a series of experiences and asks participants how often each happens to them, with options to select "Never," "Less than once a year," "A few times a year," "A few times a month," "At least once a week," and "Almost every day."[17] For this study, the nine-item version of the EDS was used.[17] Experiences queried include being treated with less respect or courtesy than others, being threatened, called names, or harassed, and being treated as dishonest or not smart.[17] This questionnaire has three methods of coding to calculate different types of scores: a situation-based score which measures the amount of different discriminatory experiences a person has had; a frequency-based score based on how often a participant experiences discrimination; and a chronicity-based score which is calculated as the number of discriminatory experiences a participant reports each year.[20] These methods of scoring allow us to assess discrimination in a variety of ways. Table 1 shows all measures of discrimination considered in this study.

iii. Heterosexist experiences

Administered to only queer participants, the Daily Heterosexist Experiences Questionnaire assesses experiences of heterosexism that queer people may experience.[21] It is a validated questionnaire which has been historically used to measure experiences of discrimination unique to queer populations.[21] The survey asks participants to consider the past year, lists a series of experiences and asks participants to rate them on a 0-5 scale: "0: Did not happen/not applicable to me," "1: It happened, and it bothered me NOT AT ALL," "2: It happened, and it bothered me A LITTLE BIT," "3: It happened, and it

bothered me MODERATELY," "4: It happened, and it bothered me QUITE A BIT," and "5: It happened, and it bothered me EXTREMELY." Questions in the DHEQ range from hearing about others' heterosexist experiences, being harassed, called names, or having to hide one's identity, to experiences of physical violence related to being queer. The survey has 50 questions in total. The DHEQ has two main methods of scoring, and both were calculated for this analysis.[21] The first scoring method is the occurrence score, which recodes values into a dichotomous "did not occur"/"did occur" variable and measures whether or not participants had each experience.[21] The DHEQ also has an alternate method of scoring, Distress, that measures the impact of participants' experiences with these forms of discrimination.[21] This method recodes responses to 1-5 (combining "0: Did not happen/not applicable to me" and "1: It happened, and it bothered me NOT AT ALL") then calculates a mean score which represents distress.[21] All scores from this survey were only calculated for queer participants, as the questions are not relevant to heterosexual participants. Table 1 shows all measures of discrimination considered in this study.

iv. Measures of metabolic syndrome and broader cardiometabolic health

At their study visit on the UMass Amherst campus, participants (N=39) gave a fasted blood sample which was assayed for levels of LDL and HDL cholesterol, HgA1c, glucose, triglycerides, and more. In addition, participants underwent a dual energy x-ray absorptiometry (iDXA) scan to determine percent body fat and anthropometric measurements were taken, including waist and hip circumference, blood pressure, and heart rate. Each participant had blood pressure measured twice using an automated blood pressure cuff, then averaged. All measurements were conducted by trained study staff.

Indicator variables for high blood pressure, high cholesterol, prediabetes and diabetes were created per NIH guidelines for metabolic syndrome.[22,23] Further, using the NIH definition of metabolic syndrome,[24] an individual must present with three or more of five symptoms in order to be considered to have the syndrome. These include: having a greater than 35 inch/88.9cm waist circumference; triglyceride levels in blood greater than or equal to 150 mg/dL; HDL cholesterol levels below 50 mg/dL; fasting blood glucose levels of greater than or equal to 100 mg/dL; and high blood pressure.[24] Additionally, high blood pressure was considered a systolic blood pressure of 130 mmHg or higher and/or a diastolic blood pressure of 85 mmHg or greater.[24,25] Notably, this is different from the NIH definition of high blood pressure on its own, which is considered to be a systolic blood pressure reading of 130 mmHg or higher and/or a diastolic blood pressure reading of 80 mmHg or higher.[26] We included additional cardiometabolic measures (such as body fat percentage) beyond those defined as metabolic syndrome by NIH. These measures are typically not included as part of routine health examinations but provide important information on cardiometabolic health.

v. Sociodemographic factors and health behaviors

A number of covariates were considered for the analysis, including age (continuous), household income (<$19,999 per year, $20,000-$39,999 per year, $40,000-$59,999 per year, $60,000-79,999 per year, >$80,000 per year, and I don't know), education (no degree or Associate's degree or higher), relationship status (single or in a relationship) and race/ethnicity (White or POC). In addition, health behaviors were considered as covariates, including hours of sleep per night (continuous), tobacco use (never, ever, or current) and alcohol use (never or ever).

vi. Statistical analysis

A total of 161 participants completed the online survey (85 queer, including 24 lesbian/gay and 61 bisexual, and 78 straight) and of these participants, 39 completed study visits (25 queer, including 8 lesbian/gay and 17 bisexual, and 14 straight). Due to small sample sizes lesbian/gay or bisexual were combined into a "queer" group for these analyses.

For descriptive statistics of sociodemographic characteristics and health behaviors, we assessed sexual identity differences using the full sample of completed surveys. Cardiometabolic measures were collected during study visits only, so for all analyses with cardiometabolic outcomes, the smaller study visit sample was used. Pearson $\chi 2$ tests were conducted to assess for independence between sexual orientation and various sociodemographic characteristics, including household income, education, relationship status and race/ethnicity as well as categorical markers of cardiometabolic health, including symptoms of metabolic syndrome. For continuous variables (which included age, hours of sleep per night, DHEQ scores, EDS scores, waist circumference, percent body fat, triglycerides, HDL and LDL cholesterol, fasting blood glucose, systolic and diastolic blood pressure, waist-hip ratios, BMI, and resting heart rate), t-tests were conducted to assess for differences in means. Additionally, the survey measures (including discrimination scores and sociodemographic/behavioral characteristics) were assessed for differences between those who completed a study visit versus those who did not, as well as by race/ethnicity using t-tests for continuous variables and Pearson $\chi 2$ tests for categorical variables.

To assess the association between discrimination and cardiometabolic health, linear regression models were fit for each of three dimensions of EDS score (chronicity, frequency, and situation), as well as DHEQ scores (occurrence and distress). Adjusted models included sociodemographic factors and health behaviors that were statistically significantly different between queer and straight participants in this sample. As a result, only relationship status was adjusted for in our analysis. We tested whether the association between discrimination and cardiometabolic health differed by sexual identity by including a sexual identity-by-discrimination interaction term. We further assessed potential differences by estimating sexual identity-specific measures of association between discrimination and cardiometabolic health.

As a sensitivity analysis, logistic regression models were fit using clinically significant cut-points of cardiometabolic health markers, as available. These measures included indicators of metabolic syndrome, including: waist circumference ≥88.9cm; triglycerides >150 mg/dL; HDL cholesterol <50 mg/dL; fasting blood glucose >100 mg/dL; high blood pressure (for metabolic syndrome, systolic blood pressure ≥130mmHg and/or diastolic blood pressure ≥85 mmHg); and a sum of the number of metabolic syndrome indicators present.[25] Consistent with the study sample age, participants had few clinically significant indicators of poor cardiometabolic health, including just one participant with metabolic syndrome. As a result, findings focus on continuous measures to determine if elevated risk of poor cardiometabolic risk may be present. Findings from logistic regression models are available in Supplemental Table 1.

All analyses and data management were conducted in Stata/BE version 18. Statistical significance was determined based on a $p<0.05$.

CHAPTER 3

RESULTS

Table 2 shows sociodemographic characteristics by sexual orientation. The average age of the sample was 22 years (SE 0.4), with a range of 18-40 years old. There were no sexual orientation differences in the sample regarding age, hours of sleep per night, household income, race/ethnicity, education, or substance use. However, they did differ in relationship status, with more queer than straight participants being in relationship.

Table 3 examines sociodemographic and behavioral characteristics, as well as discrimination scores, between those who completed study visits and those who did not. Survey participants did not significantly differ from participants who completed both the survey and a study visit, except for household income (P=0.001). A majority of study visit participants reported a household income >$80,000/year, versus survey-only participants reporting household incomes that were more spread out across the categories and overall lower. Table 4 is a comparison of discrimination scores by race/ethnicity. There were no statistically significant differences observed between White and POC participants.

Table 5 examines sexual identity differences in cardiometabolic health as well as discrimination. Waist circumference, triglycerides, HDL and LDL cholesterol, fasting blood glucose (continuous), systolic and diastolic blood pressure, waist-hip ratio, BMI, resting heart rate, percent body fat, and the sum of metabolic syndrome indicators did not differ by sexual identity. Though fasting blood glucose did not differ between sexual orientations when examined continuously, more queer participants than heterosexuals met the definition of elevated fasting blood glucose for metabolic syndrome. There were

statistically significant differences in EDS situation and frequency scores (which measure how often someone experiences discrimination and the amount of discriminatory experiences they have had, respectively). Queer participants reported, on average, having 6.9 (out of 9) possible discriminatory experiences compared to 5.3 experiences reported by straight participants. Queer participants also experienced discrimination more often than straight participants (22.3 vs. 19.1). No sexual identity differences in EDS chronicity were identified. Queer participants had an average DHEQ occurrence score of 16.1 (SE 1.1) and an average DHEQ distress score of 1.7 (SE 0.1).

Tables 6 and 7 show the results of linear regressions conducted on continuous markers of cardiometabolic health for each discrimination score category (EDS frequency, EDS situation, EDS chronicity, DHEQ occurrence, and DHEQ distress) by sexual orientation. In overall models, there were no significant associations between discrimination and cardiometabolic health. However, in sexual orientation-specific estimates, higher EDS frequency and situation scores were associated with higher levels of fasting blood glucose (β=0.542, 95% CI -0.040-1.044 and β=2.063, 95% CI 0.779-3.348, respectively) among queer participants only. This association persisted for EDS frequency and situation scores for queer participants after adjusting for relationship status (β=0.61, 95% CI 0.04-1.18 and β=2.279, 95% CI 0.874-3.685). No statistically significant associations between EDS chronicity or DHEQ scores and cardiometabolic health were identified.

Supplementary table 1 shows the results of logistic regressions conducted as a sensitivity analysis on clinically significant cut-points of cardiometabolic health markers. Only the model examining overall odds of elevated waist circumference (greater than 88.9 cm)

was statistically significant, with higher EDS chronicity scores associated with higher odds of elevated waist circumference (OR 1.01, 95% CI 1.00-1.01).

CHAPTER 4

DISCUSSION

Our analysis suggested significant differences in how queer and heterosexual participants in our study experience discrimination. Although no major differences emerged regarding cardiometabolic health between queer and heterosexual participants, this in turn when considering documented cardiometabolic health disparities between heterosexual and queer populations in other studies means that this age group may be a prime target to reduce health disparities in later adulthood.[12–15]

Our finding that queer participants experience more discrimination than their heterosexual counterparts lines up with principles of the Minority Stress Model, which explains the ways in which both distal and proximal stressors may impact minorities, including sexual minorities.[1] In addition, these findings are supported by previous research which posits that mental health stress felt by queer individuals is in part due to discriminatory experiences.[27]

Aligning with findings from Choi et al. but conflicting with Kinsky et al., our results show no difference in metabolic syndrome status by sexual orientation.[14,15] In both these studies, differences in at least some biomarkers were found, as compared to our study which found that queer participants experiencing more unique experiences of discrimination, and more frequent discrimination was associated only with fasting blood glucose.[14,15] The differences we found are fewer and smaller in magnitude than in these two studies.[14,15] However, both these studies included older women (with Kinsky et al including those aged 35-65 and Choi et al including those aged 20-60), as compared to

our study sample with a range of 18-40 years of age. The lack of major differences found in this study may be in part due to this age difference, as well as a much smaller sample size. However, even with such a small (N=39) and young (average age of 22) study population, fasting blood glucose was higher among queer participants as compared to heterosexual participants, and was associated with experiences of discrimination. This may suggest negative implications for the cardiometabolic health of the queer participants in our study as they age.

It is critical to continue following up with this study population as they age, because differences may emerge years down the line. This is true in particular when considering literature indicating that that lesbian and bisexual women are less likely to have health insurance and therefore may be able to access less preventative care than straight people.[28] Few longitudinal studies examining metabolic health differences by sexual orientation exist. One study using nearly 30 years of longitudinal cohort data from NHSII found that lesbian and bisexual women were 2.44 (95% CI 1.54-3.86) times more likely to develop T2D before age 40 as compared with heterosexual women.[13] This study indicates that targeting prevention efforts towards queer people under 40 is critical.[13] Our findings provide evidence that capturing young adults before 30 likely captures them before the onset of clinically significant cardiometabolic disease.

Our findings suggest that higher EDS frequency and situation scores were associated with higher fasting blood glucose levels among queer participants only. This finding is particularly notable given our small sample size, therefore suggesting the potential negative impact of experiencing discrimination in young adulthood and risk for diabetes and/or cardiovascular disease in mid- and older-adulthood. Other research suggests that

exposure to chronic stress can result in a prolonged state of activation of the hypothalamus-pituitary-adrenal (HPA) axis, known as allostatic load.[29,30] While allostatic load is comprised of a large array of measures, including cardiometabolic measures, it also includes measures of stress hormones (such as cortisol and epinephrine) which is released in response to stressful stimuli.[30] Both cortisol and epinephrine can increase blood glucose levels.[31] Although cortisol and epinephrine were not included in these analyses, it is possible that the association between discrimination and blood glucose among queer participants only is due to the higher levels of discrimination experienced by queer participants, thus highlighting the beginning of negative health impacts on physiologic systems due to discrimination.[31] Future research should include other measures of physiologic stress as well and determine how changes in experiences of discrimination may contribute to disease risk.

This study has several limitations. First, the cross-sectional nature of the data means that temporality cannot be determined regarding discrimination in any form and any of the health outcomes examined. Future longitudinal research in this area examining discrimination through EDS, DHEQ, and other methods of assessment can help determine the role discrimination plays in incident disease risk and whether this risk differs by sexual orientation. Also, although a standard procedure was followed for all biological sample collection and anthropometric measurements, it is still possible that between-run laboratory drift errors may have occurred in sample analysis. Nevertheless, examining health outcomes via biological sample collection (objective measurements) versus survey data (more subjective measurement) is an advancement in this area of research.

Although the Everyday Discrimination Scale and Daily Heterosexist Experiences Questionnaire are validated measures that has previously been used to assess sexual orientation discrimination, they are not all-encompassing tools.[16,17,21] It is possible that other forms of discrimination that were not able to be adjusted for (i.e. related to ability, physical appearance, or other factors) could confound the relationship between sexual orientation and experiences of discrimination. In addition, it does require a certain level of self-awareness on the part of participants to accurately recall these experiences and potentially attribute them to discrimination. However, it is not anticipated that this was a major issue with the measure, because as mentioned, these are previously validated scales that have been used in many other studies to examine experiences of discrimination successfully.[17,20,21] Additionally, the Everyday Discrimination Scale in particular was created to assess discrimination related to race/ethnicity. Because of this, there may be concerns about confounding with race/ethnicity-based discrimination on EDS scores. However, assessment between White and POC participants found no significant differences between discrimination scores in these groups, and linear regression models adjusted for race/ethnicity remained statistically significant with regard to fasting blood glucose. Because of this, it is not anticipated that this is a major concern; however, with such a small sample size it is difficult to take intersectionality into account in our analyses.

This study is likely only generalizable to a largely young population with low levels of substance use behavior, and not to other groups. As recruitment continues, efforts should be made to recruit further from the UMass Amherst campus to ensure the study

population is more representative of the population of the Pioneer Valley as a whole, rather than primarily of UMass Amherst students.

Examining these findings with a larger sample size may be beneficial, particularly regarding results from all in-person data collection, which had a sample size of just N=39. As a result of this small sample size, we had to make the decision to combine lesbian/gay and bisexual individuals into one "queer" group, which has the potential to obscure differences between these two groups, as observed in previous research.[32] The small sample size also limited the amount of variables we could control for in adjusted models. As these data are from a pilot study and recruitment is still ongoing, it is expected that these issues will be overcome as more time passes and more participants in the study are recruited.

CHAPTER 5

CONCLUSION

Continuing to examine the relationship between discrimination and health in queer populations is essential to improving the health of this group. Particularly in women, research into this area is lacking. No other studies examine discrimination's physical impacts of health on queer populations, and instead focus primarily on the mental health impacts of this issue.[7] At this time, continued data collection for PVSS is essential to increase the study sample in order to address some of the limitations of this study, and of equal importance is considering how to follow up with this population in order to assess how health differences may unfold as the group ages.

Tables

Table 1: Dimensions of the EDS and DHEQ

	Scoring method	Dimension of discrimination being assessed	Coding
EDS	Situation	Measures the number of unique experiences of discrimination a person has experienced	Recodes values into a dichotomous “did not occur”/”did occur” variable, then sums
	Frequency	Measures how often events of discrimination occur ("never" to "almost everyday")	Sums responses
	Chronicity	Measures the total number of discriminatory experiences over a one year period	Weights responses for occurrence over a one-year period, then sums
DHEQ	Occurrence	Measures whether or not a discriminatory event has occurred (yes/no) to assess how many occurrences of discrimination a person has experienced	Recodes values into a dichotomous “did not occur”/”did occur” variable, then sums
	Distress	Measures the amount of distress caused by each discriminatory event, then averages this score across all events to calculate a score that represents the average level of distress caused by a discriminatory event	Combines “Did not happen/not applicable to me” and "It happened, and it bothered me NOT AT ALL" responses, then averages answers to all questions

EDS: Everyday Discrimination Scale

DHEQ: Daily Heterosexist Experiences Questionnaire

EDS scoring adapted from Michaels et al. (2019)[20]
DHEQ scoring adapted from Balsam et al. (2013)[21]

Table 2: Sociodemographic & behavioral characteristics by sexual orientation, PVSS (2023-2024), N=161

	Heterosexual		Queer			Total	
	Mean/n	**SE/Percent**	**Mean/n**	**SE/Percent**	***P***	**Mean/n**	**SE/Percent**
Age	22.1	0.5	22.0	0.6	0.89	22.0	0.4
Hours of sleep per night	7.4	0.2	7.5	0.2	0.86	7.5	0.1
Household income					0.18		
<$19,999/yr	27	35.1	19	22.6		46	28.6
$20,000-$39,999/yr	9	11.7	5	6.0		14	8.7
$40,000-$59,999/yr	5	6.5	4	4.8		9	5.6
$60,000-79,999/yr	7	9.1	7	8.3		14	8.7
>$80,000/yr	16	20.8	25	29.8		41	25.5
I don't know	13	16.9	24	28.6		37	23.0
Education					0.48		
No degree	51	66.2	60	71.4		111	68.9
Associate's degree or higher	26	33.8	24	28.6		50	31.1
Relationship status					0.001		
In a relationship	28	35.9	52	61.2		80	49.1
Single	50	64.1	33	38.8		83	50.9
Race/ethnicity					0.05		
White	35	44.9	51	60.0		86	52.8
POC	43	55.1	34	40.0		77	47.2
Alcohol use					0.54		
Never drinker	20	74.1	20	66.7		40	70.2
Drinker	7	25.9	10	33.3		17	29.8
Smoking status					0.48		
Never smoker	52	91.2	56	96.6		108	93.9
Ever smoker	2	3.5	1	1.7		3	2.6
Current smoker	3	5.3	1	1.7		4	3.5

Continuous variables & percents rounded to nearest 1 decimal place

P-values >0.01 rounded to nearest 2 decimal places

P-values derived from Pearson $\chi 2$ tests for categorical variables and t-tests for continuous variables

Table 3. Comparison between survey group and study visit group, PVSS (2023-2024), N=161

	No study visit		Had study visit			Total	
	Mean/n	**SE/Percent**	**Mean/n**	**SE/Percent**	***P***	**Mean/n**	**SE/Percent**
EDS: chronicity score	65.3	15.8	76.7	20.	0.68	68.6	12.6
EDS: frequency score	20.7	0.7	20.8	1.1	0.96	20.7	0.6
EDS: situation score	6.1	0.3	6.2	0.4	0.85	6.1	0.2
DHEQ: occurrence	16.8	1.6	15.2	1.4	0.47	16.	1.1
DHEQ: distress	1.7	0.1	1.7	0.1	0.86	1.7	0.1
Age	21.7	0.4	23.1	1.	0.15	22.	0.4
Hours of sleep per night	7.5	0.2	7.5	0.2	0.95	7.5	0.1
Household income					0.001		
<$19,999/yr	42	34.4	4	10.3		46	28.6
$20,000-$39,999/yr	7	5.7	7	17.9		14	8.7
$40,000-$59,999/yr	8	6.6	1	2.6		9	5.6
$60,000-79,999/yr	13	10.7	1	2.6		14	8.7
>$80,000/yr	24	19.7	17	43.6		41	25.5
I don't know	28	23.	9	23.1		37	23.
Education					0.38		
No degree	87	70.7	24	63.2		111	68.9
Associate's degree or higher	36	29.3	14	36.8		50	31.1
Relationship status					0.5		
In a relationship	59	47.6	21	53.8		80	49.1
Single	65	52.4	18	46.2		83	50.9
Race/ethnicity					0.34		
White	68	54.8	18	46.2		86	52.8
POC	56	45.2	21	53.8		77	47.2

Alcohol use					0.39		
Never drinker	26	66.7	14	77.8		40	70.2
Drinker	13	33.3	4	22.2		17	29.8
Smoking status					0.17		
Never smoker	71	91.	37	100.		108	93.9
Ever smoker	3	3.8	0	0.		3	2.6
Current smoker	4	5.1	0	0.		4	3.5

Continuous variables & percents rounded to nearest 1 decimal place

P-values >0.01 rounded to nearest 2 decimal places

P-values derived from Pearson $\chi 2$ tests for categorical variables and t-tests for continuous variables

Table 4. Comparison of discrimination by race/ethnicity, PVSS (2023-2024), N=39

	White		POC			Total	
	Mean	**SE**	**Mean**	**SE**	***P***	**Mean**	**SE**
EDS: chronicity	77.8	20.6	57.6	12.8	0.43	68.6	12.6
EDS: frequency	20.8	0.8	20.7	0.8	0.91	20.7	0.6
EDS: situation	6.1	0.3	6.2	0.3	0.83	6.1	0.2
DHEQ: occurrence	16.5	1.5	15.3	1.5	0.57	16.	1.1
DHEQ: distress	1.7	0.1	1.6	0.1	0.3	1.7	0.1

Mean & SE rounded to nearest 1 decimal place

P-values derived from t-tests

Table 5. Markers of cardiometabolic health and metabolic syndrome by sexual orientation, PVSS (2023-2024), N=161

	Heterosexual		Queer			Overall	
	Mean/n	SE/Percent	Mean/n	SE/Percent	*P*	Mean/n	SE/Percent
DHEQ: occurrence	.	.	16.0	1.1		16.0	1.1
DHEQ: distress	.	.	1.7	0.1		1.7	0.1
EDS: chronicity score	53.2	12.7	82.7	21.1	0.24	68.6	12.6
EDS: frequency score	19.1	0.9	22.2	0.7	0.006	20.7	0.6
EDS: situation score	5.3	0.4	6.8	0.2	0.0007	6.1	0.2
Waist Circumference	73.6	2.3	72.6	2.6	0.78	73.0	1.8
Triglycerides (mg/dL)	80.3	7.1	93.6	11.1	0.40	88.7	7.5
HDL Cholesterol (mg/dL)	58.8	2.8	53.8	2.0	0.15	55.6	1.7
LDL Cholesterol (mg/dL)	103.8	9.3	109.3	7.2	0.64	107.3	5.6
Glucose (mg/dL)	92.5	3.1	88.4	1.7	0.22	90.0	1.6
Systolic Blood Pressure	111.2	3.5	113.8	2.7	0.56	112.9	2.1
Diastolic Blood Pressure	62.0	1.5	65.4	2.2	0.30	64.2	1.5
Waist-Hip Ratio	0.8	0.0	0.8	0.0	0.35	0.8	0.0
BMI	23.6	0.8	24.4	1.1	0.61	24.1	0.8
Resting heart rate	81.1	3.7	76.5	2.9	0.35	78.2	2.3
Total % fat	33.1	2.9	34.3	1.6	0.70	33.8	1.5
Waist circumference					0.56		
<88.9cm	12.0	85.7	22.0	91.7		34.0	89.5
>88.9cm	2.0	14.3	2.0	8.3		4.0	10.5
Triglycerides					0.27		
<150 mg/dL	12.0	100.0	19.0	90.5		31.0	93.9
>=150 mg/dL	0.0	0.0	2.0	9.5		2.0	6.1
HDL Cholesterol					0.30		
>=50 mg/dL	10.0	83.3	14.0	66.7		24.0	72.7
<50mg/dL	2.0	16.7	7.0	33.3		9.0	27.3
Glucose					0.03		
<100	9.0	69.2	20.0	95.2		29.0	85.3
>=100	4.0	30.8	1.0	4.8		5.0	14.7

Blood pressure					0.89		
Systolic blood pressure <130 mmHg and/or diastolic blood pressure <85	12.0	85.7	21.0	84.0		33.0	84.6
Systolic blood pressure >=130 mmHg and/or diastolic blood pressure >=85	2.0	14.3	4.0	16.0		6.0	15.4
Sum of metabolic syndrome criteria					0.62		
0	5.0	41.7	10.0	50.0		15.0	46.9
1	4.0	33.3	7.0	35.0		11.0	34.4
2	3.0	25.0	2.0	10.0		5.0	15.6
3+	0.0	0.0	1.0	5.0		1.0	3.1
Meets metabolic syndrome criteria?					0.43		
No	12.0	100.0	19.0	95.0		31.0	96.9
Yes	0.0	0.0	1.0	5.0		1.0	3.1

P-values derived from Pearson $\chi 2$ tests for categorical variables and t-tests for continuous variables

Sample size for all survey measures (DHEQ and EDS): N=161
Sample size for all biological measures (waist circumference, triglycerides, HDL cholesterol, LDL cholesterol, glucose, systolic blood pressure, diastolic blood pressure, waist-hip ratio, BMI, resting heart rate, and percent body fat): N=39

Table 6. Crude linear regression models examining associations between discrimination and markers of cardiometabolic health by sexual orientation, PVSS (2023-2024), N=39

Overall			
Waist Circumference	0.22 (-0.36-0.80)	0.37 (-1.07-1.81)	0.02 (-0.01-0.06)
Triglycerides (mg/dL)	-1.34 (-3.54-0.85)	-5.01 (-10.57-0.54)	-0.02 (-0.13-0.10)
HDL Cholesterol (mg/dL)	0.03 (-0.47-0.54)	-0.16 (-1.47-1.15)	0.00 (-0.02-0.03)
LDL Cholesterol (mg/dL)	0.05 (-1.64-1.74)	1.14 (-3.23-5.52)	-0.00 (-0.09-0.09)
Glucose (mg/dL)	0.02 (-0.46-0.51)	0.39 (-0.87-1.64)	0.00 (-0.02-0.03)
Systolic Blood Pressure	0.08 (-0.59-0.75)	0.48 (-1.22-2.18)	0.00 (-0.03-0.04)
Diastolic Blood Pressure	-0.13 (-0.60-0.35)	-0.07 (-1.27-1.14)	-0.00 (-0.03-0.02)
Waist-Hip Ratio	0.00 (-0.00-0.00)	0.00 (-0.01-0.01)	0.00 (-0.00-0.00)
BMI	0.16 (-0.07-0.38)	0.40 (-0.18-0.99)	0.01 (-0.01-0.02)
Resting heart rate	-0.12 (-0.84-0.61)	0.03 (-1.81-1.88)	-0.02 (-0.06-0.02)
Total % fat	0.17 (-0.28-0.61)	0.48 (-0.65-1.62)	0.01 (-0.01-0.04)
Straight			
Waist Circumference	0.48 (-0.30-1.26)	0.91 (-0.88-2.69)	0.03 (-0.01-0.08)
Triglycerides (mg/dL)	-1.74 (-3.87-0.39)	-4.73 (-9.79-0.33)	-0.07 (-0.21-0.06)
HDL Cholesterol (mg/dL)	0.45 (-0.47-1.37)	0.88 (-1.45-3.20)	0.00 (-0.05-0.06)
LDL Cholesterol (mg/dL)	1.01 (-2.13-4.15)	0.89 (-7.01-8.79)	0.11 (-0.07-0.29)
Glucose (mg/dL)	-0.59 (-1.60-0.41)	-0.81 (-3.39-1.78)	-0.01 (-0.07-0.06)
Systolic Blood Pressure	0.42 (-0.84-1.67)	0.66 (-2.19-3.51)	0.02 (-0.05-0.10)
Diastolic Blood Pressure	-0.02 (-0.56-0.52)	-0.38 (-1.57-0.82)	0.01 (-0.03-0.04)
Waist-Hip Ratio	0.00 (-0.00-0.01)	0.00 (-0.01-0.02)	0.00 (-0.00-0.00)
BMI	0.14 (-0.14-0.42)	0.39 (-0.29-1.07)	0.01 (-0.01-0.02)
Resting heart rate	0.37 (-0.94-1.68)	0.90 (-2.03-3.83)	-0.01 (-0.09-0.06)

Total % fat	0.08 (-0.95-1.11)	0.18 (-2.33-2.70)	0.03 (-0.02-0.09)		
Queer					
Waist Circumference	0.13 (-0.77-1.03)	0.12 (-2.35-2.58)	0.02 (-0.02-0.07)	0.03 (-0.93-0.99)	-9.42 (-25.50-6.66)
Triglycerides (mg/dL)	-1.72 (-5.24-1.80)	-8.59 (-18.10-0.92)	-0.00 (-0.17-0.17)	-2.24 (-6.15-1.67)	-32.09 (-104.94-40.77)
HDL Cholesterol (mg/dL)	-0.05 (-0.72-0.61)	-0.35 (-2.25-1.55)	0.01 (-0.03-0.04)	-0.30 (-1.01-0.41)	-7.55 (-20.27-5.18)
LDL Cholesterol (mg/dL)	-0.72 (-3.05-1.62)	0.89 (-5.86-7.63)	-0.05 (-0.16-0.06)	-1.27 (-3.06-0.53)	-11.51 (-45.99-22.97)
Glucose (mg/dL)	0.54 (0.04-1.04) *	2.06 (0.78-3.35) **	0.01 (-0.02-0.03)	0.45 (-0.11-1.01)	7.58 (-2.79-17.95)
Systolic Blood Pressure	-0.21 (-1.13-0.71)	0.08 (-2.52-2.68)	-0.01 (-0.05-0.04)	-0.01 (-0.89-0.87)	-5.20 (-20.79-10.38)
Diastolic Blood Pressure	-0.34 (-1.07-0.39)	-0.23 (-2.32-1.87)	-0.01 (-0.04-0.03)	0.01 (-0.69-0.71)	-7.60 (-19.58-4.39)
Waist-Hip Ratio	-0.00 (-0.01-0.00)	-0.00 (-0.02-0.01)	-0.00 (-0.00-0.00)	0.00 (-0.01-0.01)	-0.02 (-0.11-0.07)
BMI	0.16 (-0.20-0.52)	0.42 (-0.61-1.44)	0.00 (-0.01-0.02)	0.24 (-0.15-0.62)	3.77 (-3.23-10.76)
Resting heart rate	-0.23 (-1.23-0.77)	-0.16 (-2.99-2.68)	-0.02 (-0.07-0.03)	0.15 (-0.81-1.11)	10.39 (-6.09-26.86)
Total % fat	0.20 (-0.33-0.73)	0.69 (-0.80-2.18)	0.00 (-0.02-0.03)	0.50 (-0.03-1.04)	9.09 (-0.38-18.56)

* p<.05, ** p<.01, *** p<.001

Table 7. Adjusted linear regression models examining associations between discrimination and markers of cardiometabolic health by sexual orientation, PVSS (2023-2024), N=39

	EDS: frequency beta (95% CI)	EDS: situation beta (95% CI)	EDS: chronicity beta (95% CI)	DHEQ: occurrence beta (95% CI)	DHEQ: distress beta (95% CI)
Overall					
Waist Circumference	0.19 (-0.38-0.76)	0.37 (-1.05-1.78)	0.02 (-0.01-0.05)		
Triglycerides (mg/dL)	-1.53 (-3.75-0.69)	-5.33 (-10.91-0.25)	-0.02 (-0.14-0.10)		
HDL Cholesterol (mg/dL)	0.01 (-0.51-0.53)	-0.20 (-1.53-1.14)	0.00 (-0.02-0.03)		
LDL Cholesterol (mg/dL)	0.14 (-1.58-1.87)	1.32 (-3.12-5.76)	0.00 (-0.09-0.09)		
Glucose (mg/dL)	0.06 (-0.43-0.55)	0.45 (-0.81-1.71)	0.00 (-0.02-0.03)		
Systolic Blood Pressure	0.05 (-0.62-0.73)	0.47 (-1.23-2.18)	-0.00 (-0.04-0.04)		
Diastolic Blood Pressure	-0.17 (-0.62-0.28)	-0.07 (-1.23-1.09)	-0.01 (-0.03-0.02)		
Waist-Hip Ratio	0.00 (-0.00-0.00)	0.00 (-0.01-0.01)	0.00 (-0.00-0.00)		
BMI	0.15 (-0.08-0.38)	0.39 (-0.20-0.98)	0.00 (-0.01-0.02)		
Resting heart rate	-0.13 (-0.86-0.60)	0.03 (-1.84-1.90)	-0.02 (-0.06-0.02)		
Total % fat	0.15 (-0.29-0.60)	0.47 (-0.68-1.62)	0.01 (-0.01-0.04)		
Straight					
Waist Circumference	0.36 (-0.52-1.25)	0.56 (-1.54-2.67)	0.03 (-0.02-0.08)		
Triglycerides (mg/dL)	-0.75 (-2.72-1.23)	-2.11 (-7.10-2.88)	-0.02 (-0.14-0.10)		
HDL Cholesterol (mg/dL)	0.71 (-0.31-1.74)	1.61 (-1.08-4.30)	0.01 (-0.05-0.08)		
LDL Cholesterol (mg/dL)	0.31 (-3.29-3.91)	-1.64 (-10.75-7.47)	0.09 (-0.11-0.28)		
Glucose (mg/dL)	-1.04 (-1.99--0.09) *	-1.76 (-4.41-0.90)	-0.02 (-0.09-0.04)		
Systolic Blood Pressure	0.31 (-1.14-1.76)	0.31 (-3.10-3.73)	0.02 (-0.07-0.10)		

Diastolic Blood Pressure	0.00 (-0.63-0.63)	-0.44 (-1.88-1.01)	0.01 (-0.03-0.04)		
Waist-Hip Ratio	0.00 (-0.00-0.01)	0.00 (-0.01-0.01)	0.00 (-0.00-0.00)		
BMI	0.14 (-0.20-0.47)	0.39 (-0.42-1.19)	0.01 (-0.01-0.03)		
Resting heart rate	0.78 (-0.61-2.16)	2.09 (-1.06-5.24)	-0.00 (-0.09-0.08)		
Total % fat	0.22 (-0.98-1.41)	0.52 (-2.40-3.45)	0.05 (-0.02-0.11)		
Queer					
Waist Circumference	-0.17 (-1.00-0.67)	-0.70 (-2.97-1.57)	0.00 (-0.04-0.05)	-0.10 (-0.98-0.78)	-9.68 (-24.05-4.69)
Triglycerides (mg/dL)	-1.87 (-5.91-2.16)	-9.45 (-19.99-1.10)	0.01 (-0.18-0.19)	-2.33 (-6.60-1.95)	-31.56 (-108.50-45.38)
HDL Cholesterol (mg/dL)	-0.19 (-0.94-0.55)	-0.71 (-2.77-1.36)	0.00 (-0.03-0.04)	-0.39 (-1.15-0.37)	-8.38 (-21.59-4.84)
LDL Cholesterol (mg/dL)	-0.80 (-3.47-1.87)	1.24 (-6.27-8.76)	-0.05 (-0.17-0.07)	-1.22 (-3.18-0.73)	-10.11 (-46.29-26.07)
Glucose (mg/dL)	0.61 (0.04-1.18) *	2.28 (0.87-3.68) **	0.01 (-0.02-0.04)	0.43 (-0.19-1.04)	7.14 (-3.74-18.01)
Systolic Blood Pressure	-0.45 (-1.38-0.48)	-0.41 (-3.04-2.23)	-0.02 (-0.07-0.02)	-0.05 (-0.93-0.83)	-5.25 (-20.69-10.20)
Diastolic Blood Pressure	-0.61 (-1.30-0.08)	-0.77 (-2.80-1.26)	-0.02 (-0.06-0.01)	-0.03 (-0.71-0.64)	-7.64 (-19.10-3.83)
Waist-Hip Ratio	-0.00 (-0.01-0.00)	-0.01 (-0.02-0.01)	-0.00 (-0.00-0.00)	-0.00 (-0.01-0.01)	-0.02 (-0.11-0.07)
BMI	0.12 (-0.28-0.51)	0.32 (-0.75-1.39)	0.00 (-0.02-0.02)	0.21 (-0.19-0.61)	3.73 (-3.30-10.75)
Resting heart rate	-0.25 (-1.33-0.83)	-0.14 (-3.15-2.87)	-0.02 (-0.07-0.03)	0.17 (-0.81-1.15)	10.41 (-6.37-27.19)
Total % fat	0.19 (-0.39-0.78)	0.67 (-0.91-2.25)	0.00 (-0.03-0.03)	0.51 (-0.05-1.06)	9.08 (-0.70-18.86)

* p<.05, ** p<.01, *** p<.001
Adjusted for relationship status

Supplementary table 1. Logistic regression models, PVSS (2023-2024), N=39

	EDS: frequency OR (95% CI)	EDS: situation OR (95% CI)	EDS: chronicity OR (95% CI)
Overall			
Waist circumference	1.12 (0.94-1.33)	1.11 (0.70-1.76)	1.01 (1.00-1.01) *
HDL Cholesterol	1.03 (0.92-1.16)	1.08 (0.77-1.51)	1.00 (0.99-1.01)
Glucose	1.08 (0.92-1.26)	1.15 (0.75-1.78)	1.00 (1.00-1.01)
Blood pressure	0.95 (0.82-1.10)	0.99 (0.69-1.41)	1.00 (0.99-1.01)
Sum of metabolic syndrome criteria	1.09 (0.97-1.22)	1.27 (0.93-1.73)	1.01 (1.00-1.02)
Straight			
Waist circumference	1.29 (0.91-1.84)	1.50 (0.66-3.38)	1.01 (1.00-1.02)
HDL Cholesterol	0.69 (0.39-1.24)	0.53 (0.22-1.27)	0.79 (0.49-1.30)
Glucose	0.99 (0.82-1.19)	1.05 (0.67-1.64)	1.00 (0.99-1.01)
Blood pressure	1.00 (0.79-1.27)	1.07 (0.61-1.87)	0.99 (0.95-1.03)
Sum of metabolic syndrome criteria	1.03 (0.86-1.22)	1.06 (0.70-1.61)	1.01 (0.99-1.04)
Queer			
Waist circumference	1.02 (0.80-1.29)	0.86 (0.50-1.49)	1.01 (1.00-1.02)
HDL Cholesterol	1.14 (0.97-1.35)	1.99 (0.89-4.46)	1.00 (1.00-1.01)
Glucose			1.01 (0.99-1.03)
Blood pressure	0.92 (0.77-1.11)	0.93 (0.59-1.47)	1.00 (0.99-1.01)
Sum of metabolic syndrome criteria	1.14 (0.96-1.35)	1.61 (0.89-2.91)	1.01 (1.00-1.02)

* $p<.05$

REFERENCES

1. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychol Bull*. 2003;129(5):674-697. doi:10.1037/0033-2909.129.5.674

2. Patterson JG, Jabson JM. Sexual orientation measurement and chronic disease disparities: National Health and Nutrition Examination Survey, 2009–2014. *Ann Epidemiol*. 2018;28(2):72-85. doi:10.1016/j.annepidem.2017.12.001

3. Plöderl M, Tremblay P. Mental health of sexual minorities. A systematic review. *Int Rev Psychiatry Abingdon Engl*. 2015;27(5):367-385. doi:10.3109/09540261.2015.1083949

4. Caceres BA, Travers J, Sharma Y. Differences in Multimorbidity among Cisgender Sexual Minority and Heterosexual Adults: Investigating Differences across Age-Groups. *J Aging Health*. 2021;33(5-6):362-376. doi:10.1177/0898264320983663

5. Mays VM, Cochran SD. Mental Health Correlates of Perceived Discrimination Among Lesbian, Gay, and Bisexual Adults in the United States. *Am J Public Health*. 2001;91(11):1869-1876.

6. Brown C, Maragos AC. Internalized heterosexism and psychological distress: A relationship mediated by self-compassion. *J Gay Lesbian Soc Serv*. 2023;35(2):135-156. doi:10.1080/10538720.2022.2050454

7. Newcomb ME, Mustanski B. Internalized homophobia and internalizing mental health problems: A meta-analytic review. *Clin Psychol Rev*. 2010;30(8):1019-1029. doi:10.1016/j.cpr.2010.07.003

8. Bostwick WB, Boyd CJ, Hughes TL, McCabe SE. Dimensions of Sexual Orientation and the Prevalence of Mood and Anxiety Disorders in the United States. *Am J Public Health*. 2010;100(3):468-475. doi:10.2105/AJPH.2008.152942

9. Blosnich JR, Farmer GW, Lee JGL, Silenzio VMB, Bowen DJ. Health inequalities among sexual minority adults: evidence from ten U.S. states, 2010. *Am J Prev Med*. 2014;46(4):337-349. doi:10.1016/j.amepre.2013.11.010

10. Azagba S, Shan L, Latham K. Overweight and Obesity among Sexual Minority Adults in the United States. *Int J Environ Res Public Health*. 2019;16(10):1828. doi:10.3390/ijerph16101828

11. Huang PL. A comprehensive definition for metabolic syndrome. *Dis Model Mech*. 2009;2(5-6):231-237. doi:10.1242/dmm.001180

12. Caceres BA, Brody A, Luscombe RE, et al. A Systematic Review of Cardiovascular Disease in Sexual Minorities. *Am J Public Health*. 2017;107(4):e13-e21. doi:10.2105/AJPH.2016.303630

13. Corliss HL, VanKim NA, Jun HJ, et al. Risk of Type 2 Diabetes Among Lesbian, Bisexual, and Heterosexual Women: Findings From the Nurses' Health Study II. *Diabetes Care*. 2018;41(7):1448-1454. doi:10.2337/dc17-2656

14. Kinsky S, Stall R, Hawk M, Markovic N. Risk of the Metabolic Syndrome in Sexual Minority Women: Results from the ESTHER Study. *J Womens Health*. 2016;25(8):784-790. doi:10.1089/jwh.2015.5496

15. Choi YM, Pilkerton CS, Xiang J, Ashcraft AM, Seymour KA, Szoka N. Risk factors for metabolic syndrome in self-identified and questioning sexual minority women. *Obes Silver Spring Md*. 2023;31(11):2853-2861. doi:10.1002/oby.23879

16. Mason TB, Lewis RJ, Heron KE. Indirect pathways connecting sexual orientation and weight discrimination to disordered eating among young adult lesbians. *Psychol Sex Orientat Gend Divers*. 2017;4(2):193-204. doi:10.1037/sgd0000220

17. Williams DR, Yu Y, Jackson JS, Anderson NB. Racial Differences in Physical and Mental Health: Socioeconomic Status, Stress, and Discrimination. *J Health Psychol*. 1997;2(3):335-351.

18. Taylor TR, Kamarck TW, Shiffman S. Validation of the Detroit Area Study Discrimination Scale in a community sample of older African American adults: the Pittsburgh healthy heart project. *Int J Behav Med*. 2004;11(2):88-94. doi:10.1207/s15327558ijbm1102_4

19. Krieger N, Smith K, Naishadham D, Hartman C, Barbeau EM. Experiences of discrimination: validity and reliability of a self-report measure for population health research on racism and health. *Soc Sci Med 1982*. 2005;61(7):1576-1596. doi:10.1016/j.socscimed.2005.03.006

20. Michaels E, Thomas M, Reeves A, et al. Coding the Everyday Discrimination Scale: implications for exposure assessment and associations with hypertension and depression among a cross section of mid-life African American women. *J Epidemiol Community Health*. 2019;73(6):577-584. doi:10.1136/jech-2018-211230

21. Balsam KF, Beadnell B, Molina Y. The Daily Heterosexist Experiences Questionnaire: Measuring Minority Stress Among Lesbian, Gay, Bisexual, and Transgender Adults. *Meas Eval Couns Dev Off Publ Assoc Meas Eval Couns Dev*. 2013;46(1):3-25. doi:10.1177/0748175612449743

22. High cholesterol: Overview. In: *InformedHealth.Org [Internet]*. Institute for Quality and Efficiency in Health Care (IQWiG); 2017. Accessed November 1, 2023. https://www.ncbi.nlm.nih.gov/books/NBK279318/

23. The A1C Test & Diabetes - NIDDK. National Institute of Diabetes and Digestive and Kidney Diseases. Accessed November 1, 2023. https://www.niddk.nih.gov/health-information/diagnostic-tests/a1c-test

24. Swarup S, Goyal A, Grigorova Y, Zeltser R. Metabolic Syndrome. In: *StatPearls*. StatPearls Publishing; 2023. Accessed January 17, 2024. http://www.ncbi.nlm.nih.gov/books/NBK459248/

25. Metabolic Syndrome - Diagnosis | NHLBI, NIH. Published May 18, 2022. Accessed February 13, 2024. https://www.nhlbi.nih.gov/health/metabolic-syndrome/diagnosis

26. High Blood Pressure - What Is High Blood Pressure | NHLBI, NIH. Published March 24, 2022. Accessed January 28, 2024. https://www.nhlbi.nih.gov/health/high-blood-pressure

27. Mays VM, Juster RP, Williamson TJ, Seeman TE, Cochran SD. Chronic physiologic effects of stress among lesbian, gay, and bisexual adults: Results from the National Health and Nutrition Examination Survey. *Psychosom Med*. 2018;80(6):551-563. doi:10.1097/PSY.0000000000000600

28. Przedworski JM, McAlpine DD, Karaca-Mandic P, VanKim NA. Health and Health Risks Among Sexual Minority Women: An Examination of 3 Subgroups. *Am J Public Health*. 2014;104(6):1045-1047. doi:10.2105/AJPH.2013.301733

29. McEwen BS. Stress, adaptation, and disease. Allostasis and allostatic load. *Ann N Y Acad Sci*. 1998;840:33-44. doi:10.1111/j.1749-6632.1998.tb09546.x

30. Seeman TE, McEwen BS, Rowe JW, Singer BH. Allostatic load as a marker of cumulative biological risk: MacArthur studies of successful aging. *Proc Natl Acad Sci*. 2001;98(8):4770-4775. doi:10.1073/pnas.081072698

31. Hantzidiamantis PJ, Awosika AO, Lappin SL. Physiology, Glucose. In: *StatPearls*. StatPearls Publishing; 2024. Accessed March 11, 2024. http://www.ncbi.nlm.nih.gov/books/NBK545201/

32. Gonzales G, Henning-Smith C. Health Disparities by Sexual Orientation: Results and Implications from the Behavioral Risk Factor Surveillance System. *J Community Health*. 2017;42(6):1163-1172. doi:10.1007/s10900-017-0366-z