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Publication Date

2018

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Health among Black women who identify as lesbian or bisexual: Intersection of sexual
orientation and race

By

Emily Marie Yette

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Epidemiology

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Jennifer Ahern, Chair

Professor Alan Hubbard

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Spring 2018

Abstract

Health among Black women who identify as lesbian or bisexual: Intersection of sexual orientation and race

by

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Doctor of Philosophy in Epidemiology

University of California, Berkeley

Professor Jennifer Ahern, Chair

It is well established that socially marginalized groups experience worse health than dominant groups. However, many questions remain about the health of members of multiple marginalized groups, such as Black sexual minority women (SMW). In addition, research on the relationship between structural stigma and the health of members of multiple marginalized groups is scarce. This dissertation addressed important gaps in knowledge in three studies. Studies one and two investigated how sexual orientation, race, and the intersection of sexual orientation and race are associated with health-related quality of life (HRQOL; study one) and heavy episodic drinking (study two) among a general population sample of Black and White women. Study three investigated the relationship between state-level structural stigma and sexual orientation inequities in self-rated health among women, and how this relationship varies by race.

This dissertation used cross-sectional 2014 and 2015 Behavioral Risk Factor Surveillance System data from approximately 150,000 women residing in 20 states in the United States. G-computation with bootstrapping was used to estimate adjusted prevalence differences and assess for interaction between sexual orientation and race (studies one and two) and modification by race (study three). Nine measures of HRQOL were analyzed. Heavy episodic drinking was investigated among all women and among current drinkers only. Structural stigma was operationalized using an index that includes concentration of same-sex couples, state policies, proportion of secondary schools with a Gender and Sexuality Alliance, and public opinions. For studies one and two, lesbian and bisexual women were analyzed both separately and together. Due to power considerations, lesbian and bisexual women were analyzed together in study three.

Age-adjusted prevalence differences suggested that Black SMW experience worse HRQOL and higher prevalence of heavy episodic drinking than both Black heterosexual women and White heterosexual women. HRQOL among Black bisexual women was often similar to or worse than White bisexual women. Prevalence of heavy episodic drinking among Black SMW was similar to

or slightly higher than that of White SMW. Most prevalence differences comparing Black SMW to White heterosexual women suggested additive interaction such that Black SMW had worse HRQOL and higher prevalence of heavy episodic drinking than expected based on considering race and sexual orientation separately. However, HRQOL interaction results were mixed for bisexual women. Inequities in heavy episodic drinking were more pronounced when analyses were restricted to current drinkers only. Although many point estimates suggested meaningful differences in HRQOL, many 95% confidence intervals were wide and included the null. In examining structural stigma, SMW had worse self-rated health than heterosexual women in high stigma states (5.1% difference in prevalence), but not in low stigma states. The relationship between structural stigma and sexual orientation health inequities was similar for Black and White women.

Results support the hypothesis that being a member of multiple marginalized groups, compared to one marginalized group, is associated with worse HRQOL. Black SMW, especially current drinkers, appear to be at particularly high risk of heavy episodic drinking. In addition, sexual orientation and race may interact in their relationship to HRQOL and heavy episodic drinking. Findings suggest that information about the health of Black SMW, and by extension, prevention and intervention efforts, cannot be fully inferred from research on the health of other groups of women. This suggests that additional research about health behaviors, outcomes, and mechanisms among Black SMW is necessary to develop nuanced, intersectionality-informed prevention and intervention approaches. Higher structural stigma is associated with greater sexual orientation health inequities, and reducing structural stigma may reduce health inequities. Longitudinal and multi-level studies would improve understanding of the relationship between structural stigma and health, thereby informing expectations of the results of social change.

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Acknowledgements

This is a partial list of some of the people who made the last 5 years easier than they would have been otherwise. First of all, I benefit from the struggle and hard work of those who came before me, including my parents Rebecca and Harold Yette. I also benefit from the unearned privilege of some who have come before me.

I am grateful for my fellow epidemiology doctoral students, who were quick to offer resources, lessons learned, comradery, and encouragement from day one. I appreciate my dissertation chair, Jennifer Ahern, for not only her contributions to this dissertation, but also for her overall support, patience, and consideration during my time as a doctoral student. I thank my other dissertation committee members, Alan Hubbard and Mahasin Mujahid; my fellow trainees at the Alcohol Research Group (ARG); the ARG training program leaders, Sarah Zemore and Priscilla Martinez; and my ARG co-mentors, Karen Trocki and Nina Mulia. I also appreciate Janene Martinez and Vicki Fagan.

For providing research and teaching opportunities, I thank Jennifer Ahern, Barbara Abrams, Michael Bates, Sarah Gamble, Sonia Jain, Amy Mericle, and Laurie Drabble. For early enthusiasm and encouragement, I thank Jae Downing, Allegra Gordon, Paul Gilbert, and Sean Arayasirikul. I appreciate Leigh Evans's work on the history of sexual orientation questions in then Behavioral Risk Factor Surveillance System (BRFSS). I thank Deysia Levin, Monika Izano, Paul Wesson, Irene Headen, and Ryan Gamba for helping me to prepare for my qualifying exam. I acknowledge my qualifying exam committee, Russell Robinson, Nick Jewell, Jack Colford, and Art Reingold.

For moving with me to California, and trying to put up with me, I thank James Berlyn Fenison, Jr. Finally, I am very fortunate to have loving and supportive family and friends, with whom I am looking forward to spending more time.

At the end of each dissertation paper, I acknowledge paper-specific contributors, including, Jennifer Ahern, Stephanie Leonard, Amelia Wallace, Alison Cohen, Monika Izano, Ellicott Matthay, Alan Hubbard, Karen Trocki, Tonda Hughes, Brooke Rhead, Dana Goin, Nina Mulia, Catherine Duarte, Kriszta Farkas, Helen Pitchik, Marilyn Thomas, Mark Hatzenbuehler, and state BRFSS programs and coordinators. In addition, I acknowledge that this work would not have been possible without the BRFSS participants.

I received financial support from the National Institute on Alcohol Abuse and Alcoholism: Graduate Research Training on Alcohol Problems, award number T32AA007240 and Center grant P50AA005595; the Hellman Graduate Award; the Philip Brett LGBT Studies Award; and the University of California, Berkeley. The research reported here does not represent the official views of the funding sources.

Overall introduction

It is well established that sexual minority (non-heterosexual) status is associated with health-harming behaviors and poor health outcomes.¹ For example, smoking, drug use, fair or poor health, poor mental health, and activity limitation are more common among sexual minorities than heterosexuals.²⁻⁷ Recognizing that the health of sexual minorities is influenced by factors beyond solely sexual orientation, the National Academy of Medicine suggests that research on the health of sexual minorities incorporate other salient factors, such as race.¹

It is also well established that Black people in the United States experience health inequities compared to White people. For example, Black people have higher diabetes incidence, higher rates of HIV diagnosis, and worse self-rated health than Whites.⁸ At the same time, some behavioral risk factors for poor health, such as heavy episodic drinking and current smoking status, are less common among Black people than Whites.⁸ Some explanations for the health inequities experienced by both sexual minorities and Black people incorporate the psychosocial stress, discrimination, and limited access to health-promoting resources experienced by marginalized groups.⁹⁻¹³

Of course, some people are both sexual minorities and Black. Intersectionality must be considered when investigating the health of Black sexual minorities. “Intersectionality” is the idea that lived experiences are shaped by intersections of privileged and marginalized social identities, which cannot be fully understood by considering single identities in isolation, or even in “sum.”¹⁴⁻¹⁶ As intersectionality relates to public health, Bowleg explains that “multiple social identities at the micro level (i.e., intersections of race, gender, and [socioeconomic status]) intersect with macrolevel structural factors (i.e., poverty, racism, and sexism),” leading to health inequities (p. 1268).¹⁷ Thus, intersecting systems of oppression, as well as a nuanced convergence of behavioral norms from multiple social groups, may influence health behaviors and health outcomes among Black sexual minorities. Therefore, the health of Black sexual minorities can not necessarily be inferred from research on the health of sexual minorities overall or the health of Black people overall.

Research investigating the health of Black sexual minorities is growing, but many gaps remain. For example, research on the health of Black sexual minority women (SMW) is particularly sparse. Existing research demonstrates that the relationship between health and sexual orientation sometimes varies by gender.^{2,4-7} Therefore, as with Black sexual minorities overall, the health of Black SMW must be directly investigated. Areas in which there is little existing research on the relationship between sexual orientation, race, and their intersection among women include health-related quality of life (HRQOL) and heavy episodic drinking.

HRQOL is associated with behavioral risk factors and chronic illness, and provides information about a population’s “burden of preventable disease, injuries, and disabilities” (p. 7).¹⁸ Further, HRQOL is a Foundation Health Measure for Healthy People 2020 (HP2020), and includes self-reported health, which is an important predictor of morbidity and mortality.^{19,20} Heavy episodic

drinking is associated with a range of negative health outcomes, including injury, cardiovascular disease, and liver disease.^{21,22} In addition, heavy episodic drinking is associated with self-reported alcohol-related harms, such as alcohol interfering with responsibilities.²³ Reducing the proportion of people who report heavy episodic drinking is a key priority for HP2020, and is specifically highlighted in the Lesbian, Gay, Bisexual, and Transgender Health Topic Area.^{24,25}

Both HRQOL and heavy episodic drinking vary by sexual orientation and race among women.^{2,5,6,26-33} However, no studies to date have compared HRQOL or heavy episodic drinking among Black SMW to Black heterosexual women, White SMW, and White heterosexual women within a single study using a general population sample. In addition, no comparisons of HRQOL or heavy episodic drinking between Black SMW and White heterosexual women have quantitatively investigated intersectionality by assessing interaction between sexual orientation and race.⁷

In addition to race, the National Academy of Medicine also suggests that research on the health of sexual minorities incorporate stigma, including sexual orientation-related structural stigma.¹ As an expansion of earlier, more individual and interpersonal-focused conceptualizations of stigma, structural stigma “refers to societal-level conditions, cultural norms, and institutional practices that constrain the opportunities, resources, and wellbeing for stigmatized populations” (p 34).³⁴

Existing research has found a relationship between structural stigma and health among sexual minorities, but the literature is sparse and predominately focuses on mental health or substance use outcomes.³⁵⁻³⁹ For example, Hatzenbuehler et al. found a stronger relationship between sexual minority status and psychiatric morbidity in states with higher structural stigma.³⁶ The rare studies considering measures of physical health include a study that reports no association between community-level anti-gay attitudes and mortality among sexual minorities, and a study that found a relationship between structural stigma and stress reactivity among sexual minorities.^{34,40,41} Therefore, the field would benefit from more research that directly examines physical health.

In addition, the theory behind intersectionality suggests that the relationship between structural stigma and health among sexual minorities may vary by race and gender. However, I know of only two studies investigating structural stigma and health among sexual minorities that report results for women, and only one study that examines racial/ethnic differences in the relationship between sexual orientation-related structural stigma and health.^{35,39}

This dissertation is comprised of three studies that aimed to address the gaps in knowledge described above. The first two studies build on existing research by investigating how sexual orientation, race, and the intersection of sexual orientation and race are associated with HRQOL and heavy episodic drinking, with a focus on Black SMW. Specifically, the objectives of the first study were: 1) to use a general population sample of Black and White women to examine the relationship of sexual orientation and race with HRQOL and 2) to investigate

interaction in the relationship between the intersection of sexual orientation and race and HRQOL. The objectives of the second study were: 1) to use a general population sample of Black and White women to examine the relationship of sexual orientation and race with past 30-day heavy episodic drinking and 2) to investigate interaction in the relationship between the intersection of sexual orientation and race and heavy episodic drinking. Given documented differences in alcohol abstinence by sexual orientation and by race, this study also examined heavy episodic drinking prevalence among current drinkers only.³¹

The third study builds on existing research of the relationship between structural stigma and health by incorporating physical health, focusing on women, and assessing modification by race. Specifically, the objectives of the third study were: 1) to investigate the relationship between state-level structural stigma and inequities in self-rated health by sexual orientation among Black and White women combined, and 2) to analyze the relationship between state-level structural stigma and sexual orientation inequities in self-rated health separately for Black and White women.

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DISSERTATION PAPER 1

Health-related quality of life among Black sexual minority women

Abstract

Introduction: It is well established that socially marginalized groups experience worse health than dominant groups. However, many questions remain about the health of members of multiple marginalized groups, such as Black sexual minority women (SMW). The purpose of this study was to examine the relationship between health-related quality of life (HRQOL), race, and sexual orientation identity (SOI) among a general population sample of Black and White women and to assess additive interaction between SOI and race.

Methods: This study used cross-sectional 2014 and 2015 Behavioral Risk Factor Surveillance System data from 154,995 women residing in 20 US states. G-computation was used to estimate age-adjusted prevalence differences (PDs) for nine (9) dichotomized measures of HRQOL. The HRQOL of Black SMW was compared to the HRQOL of Black heterosexual women, White SMW, and White heterosexual women. Analyses were conducted in 2017.

Results: Age-adjusted PDs for all measures suggested worse HRQOL among Black SMW, compared to most of the other groups (e.g., frequent poor mental health comparing Black lesbian and heterosexual women: 0.083 (95% CI: -0.017, 0.183)); HRQOL among Black bisexual women was often similar to or worse than White bisexual women. Most PDs comparing Black SWM to White heterosexual women suggested additive interaction that led to stronger or weaker associations than expected. Although many point estimates suggested meaningful differences, many 95% confidence intervals for PDs, and when assessing for interaction, included 0.

Conclusions: Having two marginalized identities, compared to one, is often associated with worse HRQOL. In addition, race and SOI may interact in their relationship to HRQOL, such that Black SMW have worse or better HRQOL than expected.

Introduction

It is well established that socially marginalized groups, such as, sexual minorities (non-heterosexual people) and Black people in the United States (US), generally experience worse health than dominant groups.^{1,2} Research focused on members of multiple marginalized groups, such as Black sexual minority women (SMW), is growing, but many questions remain.

Among women, sexual minority status and Black race are each associated with negative health behaviors and outcomes. For example, cardiovascular disease risk, fair or poor health, and poor

mental health, are more common among SMW than heterosexual women.³⁻⁶ Compared to White women, Black women have higher diabetes incidence, higher obesity prevalence, higher rates of HIV diagnosis, and worse self-rated health and health-related quality of life (HRQOL).^{2,7} Some explanations for these health inequities incorporate the psychosocial stress, discrimination, and limited access to health-promoting resources experienced by marginalized groups.⁸⁻¹¹

“Intersectionality” acknowledges that people occupy unique social spaces at the intersection of their particular combination of privileged and marginalized identities that cannot be accurately characterized by “adding up” the identities, or the corresponding social structures¹². For example, Crenshaw articulates how the effects of multiple systems of oppression are not merely additive: “Because the intersectional experience is greater than the sum of racism and sexism, any analysis that does not take intersectionality into account cannot sufficiently address the particular manner in which Black women are subordinated.” (p. 140)¹³ As intersectionality relates to public health, Bowleg describes how individual social identities and corresponding structural factors intersect to create health inequities.¹⁴ Thus, intersecting systems of oppression may influence the health of Black SMW, and outcomes may be better than or worse than predicted based solely on an additive model.¹⁵ Intersectionality acknowledges this non-additivity, or qualitative concept of “multiplicativity,” of social identities. Existing research documents quantitative statistical interactions between social groupings and their relationship to health, which have been analyzed on additive and multiplicative statistical scales, related to but distinct from the more conceptual meaning of “multiplicative” as it relates to intersectionality.^{12,15-17} Therefore, individual associations between race and health among women, and sexual orientation and health among women cannot necessarily be “summed” to predict the health of Black SMW.

Research on the health of Black SMW exists (e.g., smoking, reproductive health, and others), but gaps remain, including HRQOL.¹⁸⁻²² HRQOL is associated with behavioral risk factors and chronic illness and provides information about a population’s “burden of preventable disease, injuries, and disabilities” (p. 7).²³ Furthermore, research on the health of Black SMW has not quantitatively characterized the relationship between the intersection of race and sexual orientation and health by comparing health among Black SMW to health among White heterosexual women.^{18,19,21} In addition, few studies have used probability samples.¹⁹

The objectives of this study were two-fold. First, this study used probability samples from 20 states to examine the relationship between HRQOL and race among Black and White SWM, and the relationship between HRQOL and sexual orientation identity (SOI) among Black women. Second, this study examined whether there was evidence of interaction in the relationship between the intersection of race and SOI and HRQOL among Black and White women, which would provide quantitative support for the concept of intersectional “multiplicativity.” The authors expected that HRQOL among Black SMW would be worse than each of the comparison groups and that race and SOI would interact in their relationship to HRQOL.

Methods

Study Sample

Data Source

The US's Behavioral Risk Factor Surveillance System (BRFSS) is a nationally representative phone survey of non-institutionalized English- or Spanish-speaking adults ages 18 and over conducted annually by states and some territories, in partnership with the US Centers for Disease Control and Prevention (CDC). The present study included the 20 states (see Appendix) that asked participants' SOI in both 2014 and 2015, and made data publicly available by December 2016. BRFSS included 446,421 non-Hispanic Black and White women in 2014 and 2015; 183,867 of those women resided in included states. The median survey response rate for all states, territories, and Washington, DC, in 2014 was 47.0% (range: 25.1% - 60.1%); the median response rate for 2015 was 47.2% (range: 33.9% – 61.1%).^{24,25} For 2014 and 2015 combined, the median response rate for states included in this study was 45.5% (range: 33.0% - 57.6%).

Participants

Analyses included participants with non-missing values for all predictor (race and SOI) and outcome variables; age group was available for all participants. Ninety percent (90%; n=166,256) of Black and White women in included states were asked to select their SOI. The present study excluded women who responded “other” or “something else” (n=578; 0.31%), “don't know/not sure” (n=1,072; 0.58%), or who refused to answer the question (n=3,097; 1.68%).²⁶ Of the 161,509 Black and White women who reported a SOI of heterosexual, lesbian, or bisexual, 6,512 (4%) were excluded due to missing at least one of the HRQOL measures. This resulted in losing between 2.2% and 4.9% of each race and SOI combination. Excluded participants tended to be older and have lower educational attainment, and a higher proportion were widowed, were Black, and had fair or poor health compared to included participants. Two (2) White heterosexual women were also excluded because they were the only participants within their strata, for a total sample size of 154,995. This study does not constitute human subjects research, per the University of California, Berkeley Committee for Protection of Human Subjects.

Measures

Predictors: SOI and race

The CDC optional module asks: “Do you consider yourself to be: 1 Straight, 2 Lesbian or gay, 3 Bisexual?” Some state-added questions explained the identity options by referencing sexual behavior and/or attraction (behavior and attraction were not collected), and/or presented the options in a different order. The study included non-Hispanic Black and non-Hispanic White women.

Outcome: HRQOL

HRQOL captures perceptions of physical or mental health, and CDC recommends the validated Healthy Days Measures, which are in the BRFSS core module.^{23,27} In addition to self-rated

general health, a useful predictor of mortality and morbidity, the Healthy Days Measures capture the number of days in the past 30 days that participants' physical health was "not good," mental health was "not good," and poor physical or mental health limited their usual activities.²⁸

Per the CDC's recommendation, number of days of poor physical health and poor mental health were summed.²³ Based on suggestions in CDC documentation, and for comparability with existing research, outcomes were dichotomized.^{23,29} Self-rated health was dichotomized as excellent, very good, or good vs. fair or poor; days measures were dichotomized as both 14 or more days ("frequent") and 7 or more days.

Covariate:

Six age categories provided by the CDC were used: 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 or older. Analyses did not adjust for other common control variables (e.g., educational attainment, marital status, income) or health behaviors (e.g., smoking) because they are likely mediators of the relationship between race and SOI and HRQOL.^{11,30,31}

Statistical Analysis

Data weighting in BRFSS accounts for the sampling design, noncoverage and nonresponse, and makes each state's data representative for that state. Analyses incorporated the BRFSS sample design stratification variable and raked weights using the survey package in Stata SE version 14.2, StataCorp, College Station, TX. Weighted proportions of each HRQOL measure and select demographics were estimated for each SOI and race combination. Crude and age-adjusted prevalence differences (PDs) comparing each HRQOL measure among Black SMW to the HRQOL of: 1) Black heterosexual women, 2) White SMW, and 3) White heterosexual women were estimated. These comparisons show differences in prevalence associated with: 1) SOI within Black women, 2) Black race within SMW, and 3) the intersection of SOI and race among Black and White women; that is, having both marginalized social identities compared to having neither. Lesbian and bisexual women were analyzed separately.^{3,6,26,29} For outcomes in which age-adjusted PDs for lesbian and bisexual women were both non-zero, in the same direction, and not statistically different at $\alpha = 0.05$, lesbian and bisexual women were also combined to increase sample size. No adjustments were made for multiple comparisons. In brief, Rothman argues that in most contexts, adjusting for multiple comparisons inaccurately presumes a "universal null hypothesis" (p. 44).³² Confidence intervals (CI) for each comparison are provided for the reader to critically examine.

Interaction on the additive scale is relevant to potential underlying causal interaction, and the presence of interaction on the additive scale is consistent with the concept of intersectional "multiplicativity."¹² To assess additive interaction, the expected PD comparing Black SMW to White heterosexual women was subtracted from the observed PD. The expected PD, assuming no additive interaction, was calculated by summing the PD associated with race among heterosexual women and the PD associated with SOI minority status among White women. In the absence of additive interaction, the observed PD is equal to the expected PD.

Age-adjusted PDs were estimated using g-computation, which standardizes each group's marginal prevalence to the age distribution of the corresponding sample.³³ For example, age-adjusted prevalences comparing Black bisexual women and Black heterosexual women were standardized to the combined age distribution of Black bisexual women and Black heterosexual women. For interaction analyses, age-adjusted prevalences were standardized to the combined age distribution of all heterosexual women and either all lesbians or all bisexual women. The underlying logistic regression allowed age to interact with SOI and race. Bootstrapping with 1000 repetitions provided 95% CIs for age-adjusted PDs; both 95% CIs and 80% CIs were calculated for differences between expected and observed PDs.³⁴ Bootstrap sampling was stratified by the BRFSS sample design stratification variable. Analyses were conducted in 2017.

Results

In general, Black bisexual or lesbian women reported the worst HRQOL, at times matched or exceeded by White bisexual women (Table 1). White heterosexual women tended to report the best HRQOL. For example, Black bisexual women reported fair or poor health more frequently than other women (29.2%); White lesbians and White heterosexual women least frequently reported fair or poor health (13% and 14% respectively).

Age-adjusted PDs for most measures and comparisons showed worse HRQOL among Black SMW; comparisons between Black bisexual women and White bisexual women were an exception with mixed associations (Table 2 and Figure 1). "Frequent" days measures, which exhibit a similar pattern of results, are included in Supplemental Table 2. Age-adjusted PDs tended to be larger (indicating worse health among Black SMW) for measures dichotomized at 7 or more days than at 14 or more days. When analyzing bisexual and lesbian women separately, most 95% CIs included 0. When analyzing bisexual and lesbian women together, estimates were more precise.

PD point estimates varied by measure and by comparison group. Across comparisons, the largest PDs tended to be for fair or poor self-rated general health (e.g., age-adjusted PD = 0.273, 95% CI = (0.073, 0.472) comparing Black lesbian women and White heterosexual women) and the smallest PDs tended to be for frequent poor physical health (e.g., age-adjusted PD = 0.024, 95% CI = (-0.091, 0.140) comparing Black lesbian women and White heterosexual women (Supplemental Table 2)). Across measures, comparisons that included White heterosexual women, in particular Black lesbians compared to White heterosexual women, tended to have the largest PDs; comparisons between Black and White bisexual women tended to have the smallest PDs.

Many comparisons between Black SMW and White heterosexual women suggested additive interaction between race and SOI. Age-adjusted PDs comparing Black lesbian women and White heterosexual women were larger in magnitude than expected in the absence of additive interaction, with the exception of frequent unhealthy days (Table 3). Age-adjusted PDs

comparing Black bisexual women and White heterosexual women tended to be weaker than, or the same as, expected. All 95% CIs, and most 80% CIs, comparing observed and expected age-adjusted PDs included 0.

Discussion

Consistent with the hypothesis, this study found that Black SMW generally reported worse HRQOL than Black heterosexual women, White SMW, and White heterosexual women. Comparisons between Black and White bisexual women were a notable exception; the poor HRQOL of Black bisexual women was sometimes matched or exceeded by the poor HRQOL of White bisexual women. The largest associations were found for comparisons between Black SMW and White heterosexual women. To the authors' best knowledge, this is the first published research to compare these HRQOL measures between these comparison groups using the same probability samples.

Some studies have investigated self-rated health among Black SMW using different methods. In contrast to the present study, researchers found no difference in age-standardized prevalence of fair or poor self-rated health when comparing combined Black lesbian (82%), bisexual (9%), and other sexual minority (9%) women with Black heterosexual women from another survey.³⁵ However, this sample was limited to Los Angeles County, and the authors used a different standardization method.³⁵ Compared to the present study, Hsieh and Ruther found both similar and contrasting results in their investigation of race, SOI, and self-rated health. However, they used different methodology than the present study, including combining non-Hispanic Black and Hispanic women.¹⁵

Previous research on the mental health of Black SMW used different methods than the present study, and reported partially consistent results. The present study found worse mental health-related HRQOL among combined Black lesbian and bisexual women than among Black heterosexual women, which is consistent with research on past indicators of psychological distress in two metropolitan non-probability samples of Black lesbian and heterosexual women.²² In the present study, Black lesbians had worse mental health-related HRQOL than White lesbians, while Black bisexual women had better mental health-related HRQOL than White bisexual women, although 95% CIs included 0 for all comparisons. These results are partially consistent with results from a New York City-based non-probability sample, which analyzed lesbian and bisexual women together.³⁶

Consistent with the "multiplicative" intersectionality-informed hypothesis of non-additivity, the present study found that sexual orientation and race may interact in their relationship to HRQOL. Most PDs comparing Black SWM to White heterosexual women implied interaction that led to either stronger or weaker associations than expected. However, all 95% CIs and most 80% CIs comparing observed and expected PDs included 0. Though not investigating the health of Black SMW specifically, some results from Hsieh and Ruther supported a non-additive relationship between SOI and race and self-rated health, while other results did not.¹⁵ However,

Hsieh and Ruther controlled for additional demographic variables and investigated a different measure of self-rated health than the present study.¹⁵ Veenstra's findings are also consistent with the theory of intersectionality's application to health, though analyses did not test the intersection of SOI and race, specifically.¹⁶

While patterns of association magnitude differed for Black lesbian and Black bisexual women, the wide CIs suggest that further research with larger sample sizes would improve confidence that these patterns reflect real phenomena. The small number of Black SMW in the present study and the underrepresentation of some US regions, highlight the need for large national surveys that collect sexual orientation information, especially in geographic regions where more Black women live. The contrast in the associations between race and HRQOL within lesbian women and within bisexual women may partially reflect the elevated prevalence of poor HRQOL among White bisexual women in this study sample. This is consistent with previous research that found worse HRQOL among bisexual women compared to lesbian women in a sample that was 80% non-Hispanic white.²⁹ In the present study, the racial disparity in college completion was larger between Black and White lesbian women than between Black and White bisexual women, which may contribute to the finding of stronger inequities in HRQOL between Black and White lesbian women than between Black and White bisexual women. Health-related behaviors, experiences of stigma and support, and other determinants of health may vary between lesbian and bisexual women and explain the different patterns of association between these SOI groups; future research will investigate health-related behavior among Black SMW within the present sample.^{29,37}

Limitations

Twenty states were eligible for inclusion, therefore, results of the present study may not generalize to the US as a whole. A small percent of women were excluded due to missing outcome variables; results may have varied slightly if they had been included. The present study may not represent the HRQOL of SMW who self-identify using a term other than "lesbian" or "bisexual" (e.g., "same gender loving" or "queer") and therefore selected "other" or "something else," or women who have same-sex attractions or sexual interactions but don't identify as a sexual minority.²⁶ Furthermore, the concept of intersectionality encompasses all social identities and the present study included only two – SOI and race – among an already disadvantaged group – women; future work should address heterogeneity within Black SMW. Finally, this study focused on Black SMW, but the health of other SMW of color is also understudied. Nevertheless, the patterns in direction and magnitude of PDs suggest the importance of further investigation of the health of Black SMW.

Conclusions

Despite its limitations, this study addressed an important knowledge gap by using a probability sample to investigate HRQOL and its relationship to race, SOI, and the intersection of race and SOI among Black and White women using a quantitative interaction analysis that aligns with concepts of intersectional "multiplicativity".¹² The present study identified a pattern of health

inequities experienced by Black SMW that, for the most part, aligns with theory and existing research. These patterns highlight the importance of further research about the health of Black SMW, such as investigating specific health conditions and health-related behaviors, to inform prevention and intervention efforts. Some research using non-probability samples has identified potential differences in health-related behaviors between Black and White SMW.^{18,21} Future work should explore determinants of health and specific points of prevention or intervention, including those in the clinical setting, that may be unique to or more nuanced among Black SMW, and should include building from Black SMW's strengths.^{36,38} In addition, longitudinal studies with diverse participants would add a life course perspective to the health of Black SMW. Finally, to the degree that societal structures and power differentials contribute to the patterns of health inequities in the present study, multi-level interventions and social change are crucial to addressing these patterns.^{11,39}

Acknowledgements

I would like to thank Jennifer Ahern, Stephanie Leonard, Amelia Wallace, Alison Cohen, Monika Izano, and Ellicott Matthey for providing feedback on earlier drafts, as well as Alan Hubbard for statistical analysis guidance. Karen Trocki and Tonda Hughes provided consultation regarding prior research among sexual minority women. I would also like to thank three anonymous reviewers for their constructive feedback. In addition, I acknowledge the state BRFSS programs and coordinators in Alaska, Colorado, Massachusetts, Michigan, New Mexico, North Carolina, and Washington for providing data that were not available through the Centers for Disease Control and Prevention. Finally, this work would not have been possible without the BRFSS participants.

The research reported here does not represent the official views of the funding sources.

Emily M. Yette was supported by the National Institute on Alcohol Abuse and Alcoholism: Graduate Research Training on Alcohol Problems, award number T32AA007240 and Center grant P50AA005595; the Hellman Graduate Award; and the Philip Brett LGBT Studies Award. She is affiliated with the Division of Epidemiology at the School of Public Health at University of California, Berkeley.

Contents of this article were presented at The 145th Annual American Public Health Association Meeting and Exposition, November 7, 2017 in Atlanta, GA.

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Table 1. Number and weighted proportions: age and HRQOL - BRFSS, selected US states, 2014 and 2015

Variable	Black						White					
	Lesbian		Bisexual		Heterosexual		Lesbian		Bisexual		Heterosexual	
	n = 150		n = 213		n = 12,464		n = 1,598		n = 1,969		n = 138,601	
	n	%	n	%	n	%	n	%	n	%	n	%
Age												
18-24	18	29.4	50	39.7	639	13.1	110	18.8	358	34.9	4194	9.1
25-34	39	29.3	60	32.7	1309	17.0	133	15.0	437	30.4	9352	12.8
35-44	26	11.3	39	14.8	1737	18.1	182	16.6	316	14.0	14387	14.5
45-54	33	17.8	23	5.0	2419	18.4	383	22.4	272	8.9	22937	19.0
55-64	23	8.4	20	3.1	3040	17.3	467	17.1	278	6.1	33818	19.4
65+	11	3.7	21	4.7	3320	16.2	323	10.1	308	5.8	53913	25.3
HRQOL measures												
Fair or poor self-rated health	36	22.9	59	29.2	2901	20.7	243	13.0	397	21.1	20365	14
Frequent poor physical health	23	16.6	35	21.1	1781	12.1	233	11.6	348	18.0	17845	12.4
Frequent poor mental health	30	21.3	51	27.8	1497	13.7	234	17.6	475	28.4	14230	12.2
Frequent unhealthy days	39	28.3	75	41.5	2776	22.2	402	26.1	679	40.3	27563	21.1
Frequent activity limitation	25	19.7	22	14.7	1223	9.0	185	11.1	264	15.1	11328	8.2
7+ days poor physical health	34	31.9	51	28.9	2512	18.2	317	17.3	478	26.3	24464	17.3
7+ days poor mental health	39	27.3	73	36.5	2183	19.9	330	24.9	677	42.1	20716	17.7
7+ unhealthy days	52	45.0	97	51.5	3903	31.9	559	38.0	918	53.1	38390	29.9
7+ days activity limitation	32	24.2	38	20.9	1685	13.0	257	15.1	382	20.7	15685	11.5

BRFSS = Behavioral Risk Factor Surveillance System; HRQOL = health-related quality of life

Table 2. Select age-adjusted HRQOL prevalence differences - BRFSS, selected US states, 2014 & 2015

HRQOL Measure	Black lesbian women compared to:					
	Black heterosexual		White lesbian		White heterosexual	
	PD	95% CI	PD	95% CI	PD	95% CI
Fair or poor self-rated health	0.142	-0.016, 0.299	0.227	0.104, 0.351	0.273	0.073, 0.472
7+ days poor physical health	0.165	0.001, 0.328	0.166	0.038, 0.294	0.220	0.008, 0.432
7+ days poor mental health	0.042	-0.059, 0.142	0.034	-0.056, 0.124	0.047	-0.068, 0.163
7+ unhealthy days	0.129	-0.030, 0.288	0.088	-0.040, 0.215	0.183	-0.023, 0.389
7+ days activity limitation	0.132	-0.008, 0.271	0.133	0.024, 0.241	0.152	-0.022, 0.326
HRQOL Measure	Black bisexual women compared to:					
	Black heterosexual		White bisexual		White heterosexual	
	PD	95% CI	PD	95% CI	PD	95% CI
Fair or poor self-rated health	0.035	-0.071, 0.142	0.070	-0.017, 0.157	0.095	-0.014, 0.204
7+ days poor physical health	0.081	-0.028, 0.190	0.020	-0.065, 0.106	0.11	-0.015, 0.234
7+ days poor mental health	0.107	0.008, 0.206	-0.036	-0.120, 0.047	0.116	0.006, 0.227
7+ unhealthy days	0.054	-0.059, 0.167	-0.041	-0.129, 0.047	0.077	-0.050, 0.203
7+ days activity limitation	0.092	-0.020, 0.203	0.030	-0.053, 0.113	0.113	-0.013, 0.239
HRQOL Measure	Black sexual minority women (combined lesbian and bisexual; "SMW") compared to:					
	Black heterosexual		White SMW		White heterosexual	
	PD	95% CI	PD	95% CI	PD	95% CI
Fair or poor self-rated health	0.067	-0.022, 0.155	0.122	0.046, 0.198	0.145	0.035, 0.255
7+ days poor physical health	0.101	0.009, 0.193	0.078	0.000, 0.155	0.134	0.018, 0.251
7+ days poor mental health	0.085	0.008, 0.162	N/A ^a	N/A ^a	0.091	0.008, 0.173
7+ unhealthy days	0.080	-0.013, 0.172	N/A ^a	N/A ^a	0.107	-0.011, 0.224
7+ days activity limitation	0.118	0.036, 0.201	0.079	0.012, 0.145	0.136	0.041, 0.231

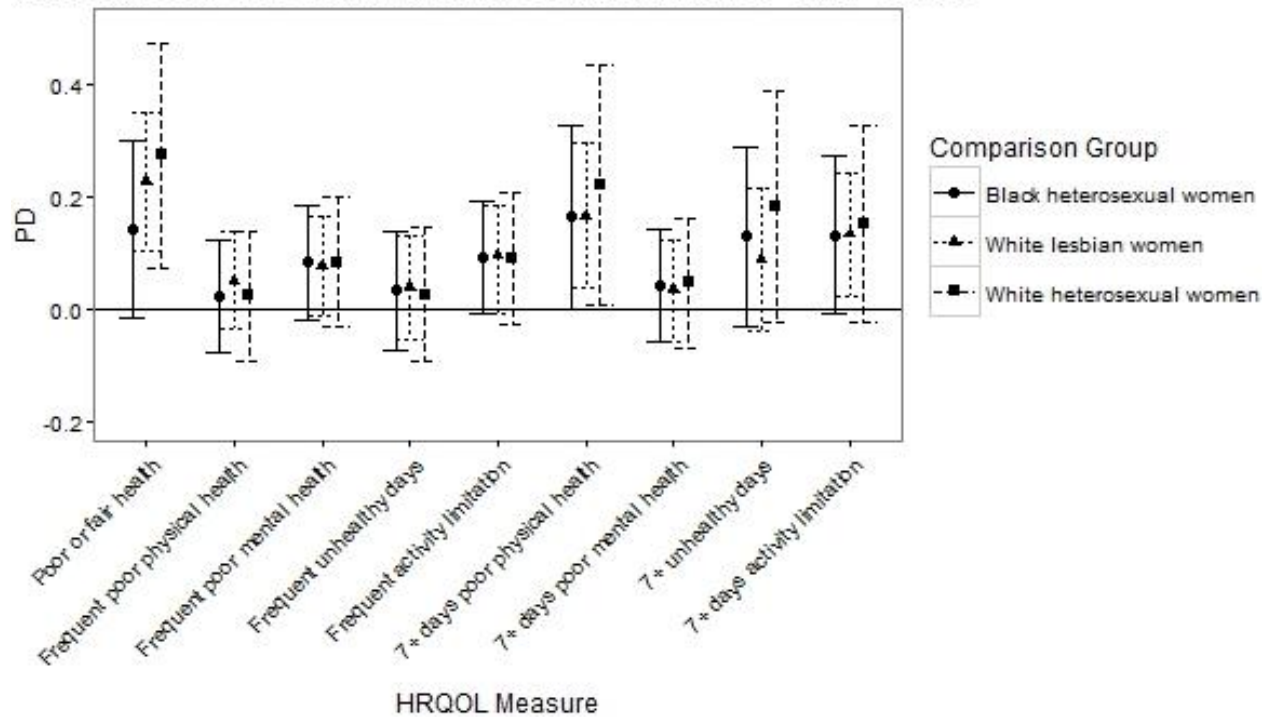
^a Estimates for lesbian and bisexual women were in different directions; Boldface indicates statistical significance ($p < 0.05$); Age-adjusted using age categories: 18-24, 25-34, 35-44, 45-54, 55-64, 65+; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; HRQOL, health-related quality of life

Table 3. Age-adjusted excess HRQOL prevalence^a due to interaction - BRFSS, selected US states, 2014 and 2015

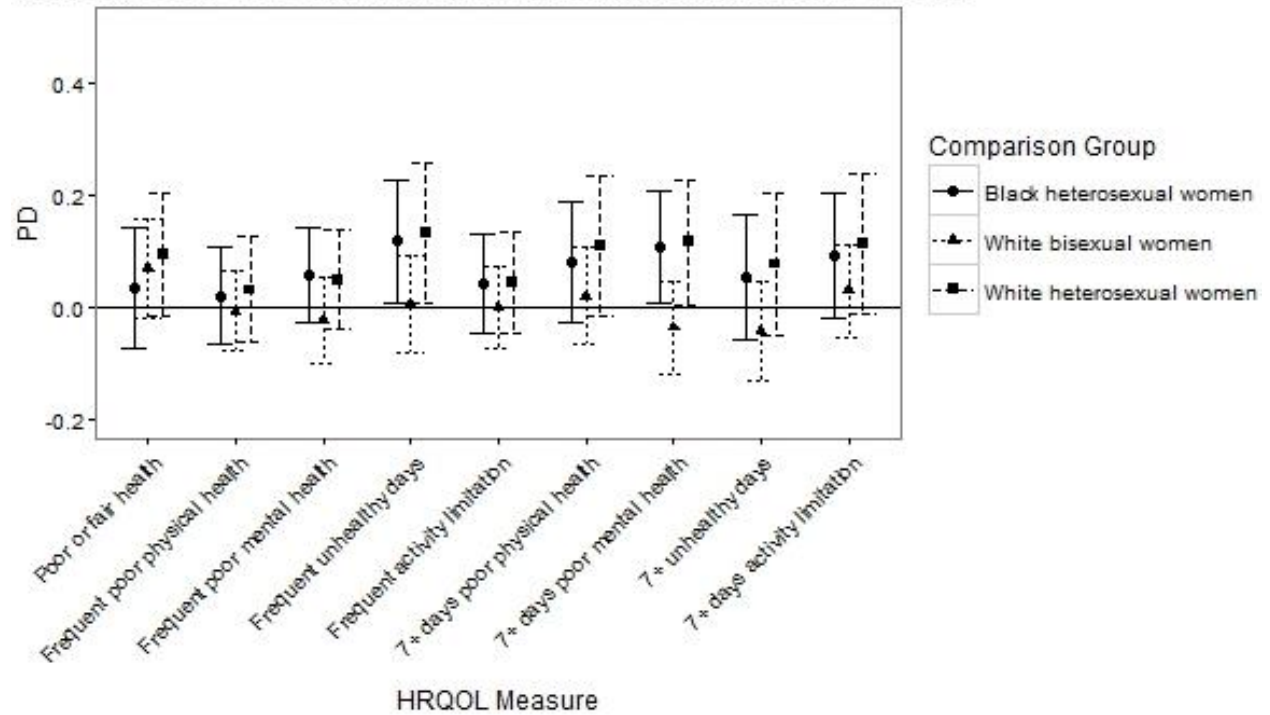
HRQOL Measure	Black lesbian women				Black bisexual women			
	Expected PD ^a	Excess prevalence ^a due to interaction			Expected PD ^a	Excess prevalence ^a due to interaction		
		Excess	95% CI	80% CI		Excess	95% CI	80% CI
Fair or poor self-rated health	0.073	0.199	-0.004, 0.402	0.067, 0.331	0.172	-0.077	-0.192, 0.038	-0.152, -0.002
Frequent poor physical health	0.014	0.011	-0.109, 0.130	-0.067, 0.089	0.072	-0.041	-0.140, 0.058	-0.106, 0.024
Frequent poor mental health	0.017	0.067	-0.049, 0.183	-0.009, 0.143	0.093	-0.043	-0.135, 0.049	-0.103, 0.017
Frequent unhealthy days	0.036	-0.008	-0.129, 0.113	-0.087, 0.071	0.129	0.004	-0.129, 0.138	-0.083, 0.091
Frequent activity limitation	0.029	0.061	-0.059, 0.180	-0.017, 0.139	0.06	-0.016	-0.109, 0.078	-0.077, 0.045
7+ days poor physical health	0.040	0.18	-0.036, 0.396	0.039, 0.321	0.095	0.015	-0.117, 0.147	-0.071, 0.101
7+ days poor mental health	0.035	0.013	-0.104, 0.130	-0.063, 0.089	0.115	0.002	-0.113, 0.116	-0.072, 0.076
7+ unhealthy days	0.080	0.103	-0.108, 0.313	-0.034, 0.240	0.135	-0.058	-0.192, 0.076	-0.146, 0.030
7+ days activity limitation	0.040	0.112	-0.064, 0.288	-0.003, 0.227	0.070	0.043	-0.086, 0.172	-0.041, 0.127

^aCompared to white heterosexual women; Boldface indicates statistical significance ($p < 0.20$, customary for interaction analyses, See Jewell (2004)); Age-adjusted using age categories: 18-24, 25-34, 35-44, 45-54, 55-64, 65+; BRFSS = Behavioral Risk Factor Surveillance System; HRQOL = Health-related quality of life

Figure 1. HRQOL among Black sexual minority women – BRFSS, selected US states, 2014 and 2015
 Age-adjusted PDs Comparing Black Lesbian Women to Other Groups



Age-adjusted PDs Comparing Black Bisexual Women to Other Groups



Age-adjusted using age categories: 18-24, 25-34, 35-44, 45-54, 55-64, 65+; BRFSS, Behavioral Risk Factor Surveillance System; HRQOL, Health-related quality of life; PDs, prevalence differences

Appendix for dissertation paper 1

States included

Alaska

Colorado

Delaware

Hawaii

Idaho

Indiana

Kansas

Maryland

Massachusetts

Michigan

Minnesota

Nevada

New Mexico

New York

North Carolina

Ohio

Pennsylvania

Virginia

Washington

Wisconsin

Appendix Table 1. Number and weighted proportions: demographics and HRQOL - BRFSS, selected US states, 2014 and 2015

Variable	Black						White					
	Lesbian		Bisexual		Heterosexual		Lesbian		Bisexual		Heterosexual	
	n = 150		n = 213		n = 12,464		n = 1,598		n = 1,969		n = 138,601	
	n	%	n	%	n	%	n	%	n	%	n	%
Age												
18-24	18	29.4	50	39.7	639	13.1	110	18.8	358	34.9	4194	9.1
25-34	39	29.3	60	32.7	1309	17.0	133	15.0	437	30.4	9352	12.8
35-44	26	11.3	39	14.8	1737	18.1	182	16.6	316	14.0	14387	14.5
45-54	33	17.8	23	5.0	2419	18.4	383	22.4	272	8.9	22937	19.0
55-64	23	8.4	20	3.1	3040	17.3	467	17.1	278	6.1	33818	19.4
65+	11	3.7	21	4.7	3320	16.2	323	10.1	308	5.8	53913	25.3
Education												
< High school	13	11.8	23	20.1	1015	12.3	34	6.1	109	11.7	5506	7.3
High school	39	28.5	62	33.7	3581	29.6	252	21.8	446	26.5	36516	28.3
Some college or tech school	48	39.0	69	31.3	3905	36.1	359	31.0	658	39.5	40578	33.8
College degree	50	20.7	59	14.9	3934	21.9	952	41.0	755	22.3	55763	30.4
Refused	0	0	0	0	29	0.2	1	0.2	1	0	238	0.2
Relationship status												
Married	25	11.4	32	10.1	3612	28.1	505	26.4	649	26.6	75603	57.5
Divorced	18	9.1	19	3.5	2438	13.8	179	9.6	337	11.0	20655	11.6
Widowed	2	0.7	11	2.1	1842	9.5	48	1.6	141	2.9	24010	10.8
Separated	3	2.4	11	3.4	626	4.8	22	1.5	61	3.4	1890	1.5
Never married	93	73.2	123	74.3	3626	40.1	526	39.5	589	43.6	13250	15.3
Member of an unmarried couple	9	3.3	15	4.3	235	3.0	304	20.7	187	12.2	2636	2.9
Refused	0	0	2	2.4	85	0.5	14	0.7	5	0.3	547	0.3
Missing	0	0	0	0	0	0	0	0	0	0	10	0
HRQOL measures												
Fair or poor self-rated health	36	22.9	59	29.2	2901	20.7	243	13.0	397	21.1	20365	14.0
Frequent poor physical health	23	16.6	35	21.1	1781	12.1	233	11.6	348	18.0	17845	12.4

Frequent poor mental health	30	21.3	51	27.8	1497	13.7	234	17.6	475	28.4	14230	12.2
Frequent unhealthy days	39	28.3	75	41.5	2776	22.2	402	26.1	679	40.3	27563	21.1
Frequent activity limitation	25	19.7	22	14.7	1223	9.0	185	11.1	264	15.1	11328	8.2
7+ days poor physical health	34	31.9	51	28.9	2512	18.2	317	17.3	478	26.3	24464	17.3
7+ days poor mental health	39	27.3	73	36.5	2183	19.9	330	24.9	677	42.1	20716	17.7
7+ unhealthy days	52	45.0	97	51.5	3903	31.9	559	38.0	918	53.1	38390	29.9
7+ days activity limitation	32	24.2	38	20.9	1685	13.0	257	15.1	382	20.7	15685	11.5

BRFSS = Behavioral Risk Factor Surveillance System; HRQOL = health-related quality of life

Appendix Table 2. Age-adjusted HRQOL prevalence differences - BRFSS, selected US states, 2014 and 2015

HRQOL Measure	Black lesbian women compared to:					
	Black heterosexual		White lesbian		White heterosexual	
	PD	95% CI	PD	95% CI	PD	95% CI
Fair or poor self-rated health	0.142	-0.016, 0.299	0.227	0.104, 0.351	0.273	0.073, 0.472
Frequent poor physical health	0.024	-0.075, 0.123	0.051	-0.034, 0.137	0.024	-0.091, 0.140
Frequent poor mental health	0.083	-0.017, 0.183	0.078	-0.010, 0.166	0.084	-0.032, 0.199
Frequent unhealthy days	0.033	-0.072, 0.138	0.038	-0.054, 0.131	0.027	-0.092, 0.146
Frequent activity limitation	0.092	-0.009, 0.192	0.096	-0.008, 0.183	0.090	-0.028, 0.207
7+ days poor physical health	0.165	0.001, 0.328	0.166	0.038, 0.294	0.220	0.008, 0.432
7+ days poor mental health	0.042	-0.059, 0.142	0.034	-0.056, 0.124	0.047	-0.068, 0.163
7+ unhealthy days	0.129	-0.030, 0.288	0.088	-0.040, 0.215	0.183	-0.023, 0.389
7+ days activity limitation	0.132	-0.008, 0.271	0.133	0.024, 0.241	0.152	-0.022, 0.326
HRQOL Measure	Black bisexual women compared to:					
	Black heterosexual		White bisexual		White heterosexual	
	PD	95% CI	PD	95% CI	PD	95% CI
Fair or poor self-rated health	0.035	-0.071, 0.142	0.070	-0.017, 0.157	0.095	-0.014, 0.204
Frequent poor physical health	0.021	-0.064, 0.106	-0.006	-0.078, 0.067	0.031	-0.062, 0.125
Frequent poor mental health	0.058	-0.028, 0.143	-0.023	-0.099, 0.053	0.050	-0.040, 0.140
Frequent unhealthy days	0.118	0.009, 0.228	0.005	-0.081, 0.091	0.133	0.008, 0.259
Frequent activity limitation	0.042	-0.045, 0.129	-0.001	-0.074, 0.072	0.045	-0.047, 0.136
7+ days poor physical health	0.081	-0.028, 0.190	0.020	-0.065, 0.106	0.110	-0.015, 0.234
7+ days poor mental health	0.107	0.008, 0.206	-0.036	-0.120, 0.047	0.116	0.006, 0.227
7+ unhealthy days	0.054	-0.059, 0.167	-0.041	-0.129, 0.047	0.077	-0.050, 0.203
7+ days activity limitation	0.092	-0.020, 0.203	0.030	-0.053, 0.113	0.113	-0.013, 0.239

HRQOL Measure	Black sexual minority women (combined lesbian and bisexual; "SMW") compared to:					
	Black heterosexual		White SMW		White heterosexual	
	PD	95% CI	PD	95% CI	PD	95% CI
Fair or poor self-rated health	0.067	-0.022, 0.155	0.122	0.046, 0.198	0.145	0.035, 0.255
Frequent poor physical health	0.032	-0.033, 0.097	N/A ^a	N/A ^a	0.037	-0.033, 0.107
Frequent poor mental health	0.079	0.017, 0.140	N/A ^a	N/A ^a	0.071	0.009, 0.132
Frequent unhealthy days	0.095	0.014, 0.179	N/A ^a	N/A ^a	0.100	0.006, 0.195
Frequent activity limitation	0.071	0.008, 0.133	N/A ^a	N/A ^a	0.070	0.005, 0.135
7+ days poor physical health	0.101	0.009, 0.193	0.078	0.000, 0.155	0.134	0.018, 0.251
7+ days poor mental health	0.085	0.008, 0.162	N/A ^a	N/A ^a	0.091	0.008, 0.173
7+ unhealthy days	0.080	-0.013, 0.172	N/A ^a	N/A ^a	0.107	-0.011, 0.224
7+ days activity limitation	0.118	0.036, 0.201	0.079	0.012, 0.145	0.136	0.041, 0.231

^a Estimates for lesbian and bisexual women were in different directions; Boldface indicates statistical significance ($p < 0.05$); Age-adjusted using age categories: 18-24, 25-34, 35-44, 45-54, 55-64, 65+; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; HRQOL, health-related quality of life; SMW, sexual minority women

DISSERTATION PAPER 2

Past 30-day heavy episodic drinking among Black women who identify as lesbian or bisexual: Evidence of interaction between sexual orientation and race

Abstract

Objective: To examine the relationship of sexual orientation identity, race, and their interaction with past 30-day heavy episodic drinking (HED) in a general population sample of Black and White women.

Methods: Cross-sectional data from 158,985 Black and White women who participated in the Behavioral Risk Factor Surveillance System in 2014 or 2015 were analyzed. Age-adjusted prevalence differences (PD) of HED comparing Black sexual minority women (SMW) to Black heterosexual women, White SMW, and White heterosexual women were estimated.

Results: Among Black women, sexual minority status was associated with substantially higher prevalence of HED (age-adjusted PD = 0.12, 95% CI: 0.04, 0.20). Among SMW, Black race was associated with a slightly, not statistically significant, higher prevalence of HED (age-adjusted PD = 0.033, 95% CI: -0.035, 0.101). When comparing Black SMW to White heterosexual women, there was evidence of additive interaction, such that prevalence of HED was higher among Black SMW than would be expected. All PDs increased when analysis was restricted to current drinkers.

Conclusions: Black SMW, especially current drinkers, appear to be at particularly high risk of HED. Nuanced, intersectionality-informed prevention and intervention approaches are warranted.

Introduction

Heavy episodic drinking (HED) is associated with a range of negative health outcomes, including injury, cardiovascular disease, and liver disease.^{1,2} In addition, HED is associated with self-reported alcohol-related harms, such as alcohol interfering with responsibilities.³

Reducing the proportion of people who report HED is a key priority for Healthy People 2020 (HP2020), and is specifically highlighted in the Lesbian, Gay, Bisexual, and Transgender Health Topic Area.^{4,5} Disparities based on sexual minority (non-heterosexual) status in hazardous drinking, including HED, are more consistent and pronounced among women than men. Among women, numerous studies demonstrate that hazardous drinking and HED are more common among sexual minority women (SMW) than heterosexual women.⁶⁻¹³ The minority stress model posits that stigmatization of sexual minorities leads to chronic psychosocial stress, beyond existing stressors unrelated to the stigmatized status.¹⁴ In some studies, measures related to

sexual minority stress have been associated with alcohol consumption and disorders.^{14–18} In addition, known risk factors for hazardous drinking, such as childhood physical and sexual abuse, earlier age of alcohol initiation, and psychological distress, are more common among SMW than heterosexual women.¹⁹ Further, alcohol and drug consumption norms among SMW may be more permissive than among heterosexual women, and traditional marital, childbearing, and parenting responsibilities that may limit heterosexual women’s alcohol consumption are less common among SMW.^{20,21}

Recognizing that the health of sexual minorities, including SMW, is influenced by factors beyond solely sexual orientation, the Health and Medicine Division of the National Academies suggests that research on the health of sexual minorities incorporate other salient factors, such as race.²² Compared to White women, Black women are more likely to abstain from alcohol and, on average over the life course, are less likely to drink heavily when they do drink.^{23,24} Explanations for differences in alcohol consumption between Black and White women include historical limited alcohol use among Africans and slaves of African descent in the United States, current African American cultural norms and attitudes that discourage alcohol use and intoxication, parental factors that regulate initiation of alcohol use, racial socialization about the potential negative consequences of alcohol use, religiosity, and the potential for differences in physiological responses to alcohol.²⁵

“Intersectionality” is the idea that lived experiences are shaped by intersections of privileged and marginalized social identities, which cannot be fully understood by considering any single identity in isolation.^{26,27} As intersectionality relates to public health, Bowleg explains that “multiple social identities at the micro level (i.e., intersections of race, gender, and [socioeconomic status] intersect with macrolevel structural factors (i.e., poverty, racism, and sexism),” leading to health inequities (p. 1268).²⁸ Thus, intersecting systems of oppression, as well as a nuanced convergence of alcohol norms from multiple social groups, may influence the drinking behavior of Black SMW.^{18,29} Therefore, alcohol consumption patterns of SMW overall or Black women overall may not extend to Black SMW. In addition, individual associations between sexual orientation and race and drinking behavior cannot necessarily be “summed” to predict the drinking behavior of Black SMW.

However, research on the alcohol consumption of Black SMW is sparse. Among current drinkers in Los Angeles County, Black SMW were more likely than Black heterosexual women to report 3 or more drinks per drinking day.³⁰ Using a national probability sample, Trinh et al. found elevated prevalence of HED among Black SMW compared to Black heterosexual women and lower prevalence of HED among Black SMW compared to White heterosexual women, though neither result was statistically significant.³¹ Among a purposive sample in Chicago, Black lesbians had slightly higher (though not statistically significant) adjusted odds of past year HED, defined as 6 or more drinks in a day, compared to White lesbians.³² In contrast, results from a national probability sample showed lower adjusted odds of past-year hazardous drinking among Black SMW than White SMW.²³ No studies to date have compared Black SMW to Black heterosexual women, White SMW, and White heterosexual women within a single study using

a general population sample. In addition, Trinh et al.'s comparison between Black SMW and White heterosexual women did not assess for interaction. The present study adds to the current literature by addressing these gaps, as well as employing a measure of HED that aligns with HP2020 and reporting results separately for Black lesbian and bisexual women.

Specifically, the objectives of the present study were two-fold: 1) to use a general population sample of Black and White women to examine the relationship of sexual orientation and race with past 30-day HED and 2) to investigate interaction in the relationship between the intersection of sexual orientation and race and HED. Given documented differences in alcohol abstinence by sexual orientation and by race, the present study also examined HED prevalence among current drinkers only.²³

Methods

Data Source

The United States' (US) Behavioral Risk Factor Surveillance System (BRFSS) is an annual, nationally representative telephone survey of non-institutionalized English- or Spanish-speaking adults conducted by states and some US territories, in partnership with the US Centers for Disease Control and Prevention (CDC). The present study included data from the 20 states (see Appendix) that collected participants' sexual orientation identity (SOI) in both 2014 and 2015, and released data to the public by December 2016. The combined 2014 and 2015 median response rate for states included in the present study was 45.5% (range: 33.0% - 57.6%).^{33,34}

Measures

Exposures: Sexual orientation identity (SOI) and race

The present study categorized respondents based on their self-identified sexual orientation. States using the CDC optional module asked: "Do you consider yourself to be: 1 Straight, 2 Lesbian or gay, 3 Bisexual?" Some state-added questions included one or more of the following variations: offered the response options in a different order, included the terms "heterosexual" and "homosexual" in addition to those above, used letters instead of numbers preceding the response options, explained the options by referencing sexual behavior and/or attraction, and allowed interviewers to read aloud "Other" as an option. Women who selected homosexual, lesbian or gay, or bisexual were considered sexual minorities. We included women who reported being non-Hispanic and either Black or White.

Outcome: HED

Consistent with the HP2020 definition, women were considered positive for HED if they reported having 4 or more drinks on an occasion in the past 30 days. Women were considered "current drinkers" if they reported consuming alcohol on 1 or more days in the past 30 days.

Covariate

Participant age was reported in 5-year categories in public use data. To increase cell sizes, this study used six age categories provide by the CDC: 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to

64, and 65 or older. The present study did not adjust for other common variables (e.g., educational attainment, marital status, income) because they are likely the consequence of racial or sexual orientation group membership and are therefore not a confounder.³⁵⁻³⁷

Participant exclusions

There were 183,867 non-Hispanic Black and White women in included states for 2014 and 2015. Analyses included participants with non-missing values SOI, race, and HED, which resulted in omitting between 1.2% and 4.5% of each SOI and race combination. Age was available for all participants. Ninety percent (90%; n=166,256) of Black and White women in included states had non-missing values for sexual orientation. Of those, the present study excluded women who responded “other” or “something else” (n=578; 0.31%), “don’t know/not sure” (n=1,072; 0.58%), or who refused to answer the question (n=3,097; 1.68%).³⁸ Of the 161,509 Black and White women who reported an SOI of heterosexual, lesbian, or bisexual, 2,524 (1.6%) were excluded due to missing the HED variable. Compared to included participants, those excluded due to missing HED tended to be slightly younger. Approximately 1.6% (weighted proportion) of White participants were excluded due to missing HED, compared to 2.6% of Black participants. The final sample size for the present study was 158,985.

Statistical Analysis

BRFSS uses raking, or iterative proportional fitting, to create survey weights that account for the sampling design, noncoverage and nonresponse, and make each state’s data representative of that state given a number of demographic and geographic variables. Analyses utilized the survey package in Stata SE version 14.2 to incorporate the BRFSS sample design stratification variable and weights. Weighted proportions of alcohol consumption measures and select demographics were calculated for each SOI and race combination. Age-adjusted prevalence differences (PDs) were calculated comparing the prevalence of HED among Black SMW to the HED of: 1) Black heterosexual women, 2) White SMW, and 3) White heterosexual women. These comparisons show differences in prevalence associated with: 1) sexual minority status within Black women, 2) Black race within SMW, and 3) the intersection of sexual minority status and race within women. Lesbian and bisexual women may have distinct alcohol consumption habits and were therefore analyzed both separately and together.^{8,11,22,38} Next, the sample was restricted to current drinkers only and the analyses were repeated. This resulted in 18 age-adjusted PDs and 6 age-adjusted interaction analyses. Each comparison was motivated by literature on alcohol consumption patterns and the reader is encouraged to critically consider each result presented. Therefore, no adjustments were made for multiple comparisons.³⁹ No Black lesbian women age 65 and over reported HED in the past 30 days, therefore comparisons to Black lesbian women only include ages 18-64.

Interaction can be measured on the additive or multiplicative scale. The present study investigated interaction on the additive scale because of its relevance to population health and its applicability to the theory of intersectionality.⁴⁰ To assess the presence of additive interaction, the expected PD comparing Black SMW to White heterosexual women was subtracted from the observed PD. This provides the estimated excess prevalence due to

interaction. Assuming no additive interaction, the expected PD is the sum of the PD associated with sexual minority status among White women and the PD associated with race among heterosexual women. In the absence of additive interaction, the observed PD and expected PD are the same.

G-computation was used to estimate age-adjusted PDs, which standardizes each group's marginal prevalence to the age distribution of the corresponding sample.⁴¹ For example, age-adjusted prevalences comparing Black lesbian women and White lesbian women were standardized to the combined age distribution of Black and White lesbian women. For interaction analyses, age-adjusted prevalences were standardized to the combined age distribution of all heterosexual women and either all lesbian women, all bisexual women, or combined lesbian and bisexual women. Bootstrapping (1000 repetitions) provided 95% confidence intervals for age-adjusted PDs and differences between expected and observed PDs; 80% CIs were also calculated for the interaction analyses.⁴² Bootstrap sampling incorporated the BRFSS sample design stratification variable.

Results

Among all women and among current drinkers only, HED was more prevalent among Black SMW than Black heterosexual women, White SMW, and White heterosexual women (Table 1). Black SMW had higher age-adjusted prevalence of HED than each comparison group (Table 2). For example, when comparing Black lesbian and heterosexual women, the estimated age-adjusted prevalence of HED was 0.208 among Black lesbian women and 0.094 among Black heterosexual women, resulting in an age-adjusted PD of approximately 0.11 (95% CI: 0.03, 0.20). Age-adjusted PDs ranged from approximately 0.02 (comparing Black and White lesbian women) to 0.15 (comparing Black bisexual and Black heterosexual women). Age-adjusted PDs comparing Black SMW to White SMW were small in magnitude and 95% confidence intervals included 0. When analyzing lesbian and bisexual women separately, 95% confidence intervals for age-adjusted PDs comparing HED between Black SMW and White heterosexual women also included 0, due to imprecise estimates. When analyses were restricted to current drinkers only, all age-adjusted PDs increased (Table 2).

HED among Black SMW was more prevalent than would be expected based on the separate associations of SOI with HED and race with HED (Table 3). Excess prevalence due to interaction was 0.056 (95% CI: -0.033, 0.146; 80% CI: -0.002, 0.115) for Black lesbian women and 0.129 (95% CI: -0.017, 0.275; 80% CI: 0.034, 0.225) for Black bisexual women (Table 2). Point estimates for excess prevalence due to interaction were larger among current drinkers (0.144 (95% CI: -0.036, 0.325; 80% CI: 0.027, 0.262) for Black lesbian women and 0.27 (95% CI: 0.066, 0.474; 80% CI: 0.137, 0.403) for Black bisexual women).

Discussion

The present study suggests that past 30-day HED is more prevalent among Black SMW than among Black heterosexual women and White heterosexual women. Past 30-day HED prevalence among Black SMW is similar to, or perhaps slightly more common than, HED among White SMW. Results also suggest that SOI and race interact in their relationship to HED. All disparities are more pronounced among current drinkers.

The finding of elevated prevalence of HED associated with SOI within Black women is consistent with existing research. Multiple studies have documented more concerning drinking patterns among SMW than heterosexual women overall, but few have reported results specifically for Black women.^{6–11,30,31}

Results for the relationship between race and drinking within SMW are similar to those of Hughes et al. and inconsistent with those of Drabble et al., both described above.^{23,32} However, those studies used different measures of alcohol consumption and controlled for additional variables, such as religiosity, that may mediate the relationship between race and alcohol consumption. Higher prevalence of HED among Black SMW compared to White SMW is substantially more pronounced when analysis is restricted to past 30-day current drinkers. That is, among SMW who consumed alcohol in the past month, HED is more prevalent among Black SMW than White SMW. Hughes et al. proposed that the similarities in alcohol consumption between Black and White SMW past-year current drinkers in their sample were partially due to factors associated with alcohol consumption among SMW “overrid[ing]” ethnic-related influences on drinking behavior (p. 587).³² However, that does not translate to the elevated prevalence of HED associated with Black race among SMW past-month current drinkers in the present study.

It is possible that Black SMW have access to fewer factors protective against HED than both Black heterosexual women and White SMW. Among Black Americans, past research documents a protective association between involvement with African American culture, as well as religious involvement, and alcohol use.²⁵ However, it is unclear to what degree Black SMW participate in, and are influenced by, the norms that may limit alcohol use among Black women overall. For example, SMW overall are less likely to report religiosity or membership in a religion with unfavorable attitudes about drinking.²³ However, within SMW, Black SMW may be more likely than White SMW to report religiosity and spirituality.⁴³ Regardless, the protective association between religious factors and alcohol use patterns found among heterosexual women is inconsistent, and even potentially reversed, among SMW.^{23,43,44} Further, within SMW reporting high religiosity, Drabble and colleagues found that Black SMW were more likely than White SMW to report past-year hazardous drinking.⁴³

Consistent with the intersectionality-informed hypothesis, PDs comparing past 30-day HED between Black SMW and White heterosexual women suggest non-additivity in the relationship between the intersection of SOI and race and HED among Black and White women. That is, SOI

and race interact in their relationship with HED such that Black lesbian and Black bisexual women reported higher prevalence of HED than would be expected based solely on the separate relationships of SOI with HED, and race with HED. This result is especially pronounced when analysis is restricted to current drinkers only. In contrast, Trinh, Agénor, Austin, and Jackson did not find elevated prevalence of HED among Black SMW compared to White heterosexual women.³¹ Results may differ due to many methodological differences between the present study and that of Trinh et al. For example, Trinh et al. included additional covariates, including self-rated health, used a different measure of HED, and used national data. Previous quantitative research supports the theory of intersectionality as applied to health.^{45,46} However, the present study is the first to quantitatively characterize the excess prevalence of HED due to interaction between SOI and race among women.

The present study presents results separately for lesbian and bisexual women. Many PD point estimates for analyses with bisexual women were larger than point estimates for analyses with lesbian women. However, confidence intervals were wide and results among bisexual women were not statistically different from results among lesbian women at $\alpha = 0.05$ or 0.20 . In addition to potentially different levels of drinking between lesbian and bisexual women, some research suggests that SOI-related mediators of HED may be different for lesbian and bisexual women.⁴⁷ This is important to consider when working to prevent and reduce elevated HED among Black SMW.

Limitations

Only twenty states met inclusion criteria for the present study, therefore, results may not generalize to the US as a whole. For instance, “moderate” drinking states were overrepresented in the present study while “dry” states were underrepresented.⁴⁸ In addition, the findings may not represent HED among women who self-identify as sexual minorities, but use a term other than “lesbian” or “bisexual” (e.g., “same gender loving” or “queer”) and therefore selected “other” or “something else,” or women who experience same-sex attractions or sexual encounters but identify as heterosexual.³⁸ There is likely heterogeneity in drinking within Black SMW that is not addressed in the present study. For example, research suggests that both racial and sexual orientation disparities in alcohol consumption vary by age.^{11,49–52} To the best of our knowledge, this has not been investigated among Black SMW, likely due to limited sample sizes. In addition, the present study included only two social identities, SOI and race, among an already disadvantaged group – women, while the theory of intersectionality encompasses all social identities. As the population of interest is Black SMW, this study does not address HED among other SMW of color. However, sample sizes for other race/ethnicities were even smaller than that of Black SMW, likely leading to imprecise estimates. Included participants varied from excluded participants in age, education, marital status, race, and past 30-day HED, which may have slightly affected results. Prevalence of past 30-day HED is only one component of alcohol consumption, and other research suggests that the relationship between HED and negative consequences may vary by frequency and intensity of HED, as well as by overall drinking patterns.^{1,2,53} Therefore, past-30 day HED alone does not fully describe an individual’s or

population's risk for alcohol-related consequences. Despite these limitations, results suggest that alcohol consumption patterns among Black SMW, particularly current drinkers, warrant more attention.

Study Implications

Given the elevated prevalence of HED, Black SMW may be at higher risk of experiencing the negative health and social consequences associated with hazardous alcohol consumption. Some research shows that alcohol-related harms may vary by sexual orientation and race when considered separately.^{24,54} The present study's novel and important finding of excess prevalence of HED associated with the intersection of SOI and race suggests that it is also important to investigate alcohol-related consequences among Black SMW in particular. Very little research has investigated alcohol-related harms among Black SMW.^{32,55} Future research should more fully investigate drinking patterns, burden of alcohol-related problems, and longer term health effects of these problems among Black SMW to better understand how alcohol consumption patterns affect this group of women.

The present study's findings highlight the need for others to investigate how to disrupt the elevated prevalence of HED among Black SMW. Prevention and intervention efforts aimed at Black SMW may need to address why HED among Black SMW doesn't seem to be controlled in the same way that it is among Black heterosexual women. Perhaps a better understanding of Black SMW's experiences of support and inclusion by communities of origin would provide direction. For example, qualitative work suggests that some Black SMW may leave more conservative churches for inclusive churches, or stay in non-affirming churches and "pass" as straight at church.⁵⁶ However, it is unknown how these decisions and particular churches influence alcohol consumption among Black SMW. In addition, changes in contextual factors associated with reduced hazardous alcohol use among SMW overall may be particularly beneficial to Black SMW.⁵⁷

In conclusion, Black SMW report particularly elevated prevalence of HED. SOI and race may interact in their relationship with HED, suggesting that drinking patterns, alcohol-related consequences, and alcohol-related prevention and intervention among Black SMW should be approached with an intersectionality-informed lens.

Acknowledgements

I would like to thank Jennifer Ahern, Amelia Wallace, Ellicott Matthay, Brooke Rhead, Dana Goin, and Nina Mulia for providing feedback on earlier drafts, as well as Alan Hubbard for statistical analysis guidance. Karen Trocki and Tonda Hughes provided consultation regarding prior research among sexual minority women. In addition, I acknowledge the state BRFSS programs and coordinators in Alaska, Colorado, Massachusetts, Michigan, New Mexico, North Carolina, and Washington for providing data that was not available through the Centers for

Disease Control and Prevention. Finally, this work would not have been possible without the BRFSS participants.

Emily M. Yette was supported by the National Institute on Alcohol Abuse and Alcoholism: Graduate Research Training on Alcohol Problems, award number T32AA007240 and Center grant P50AA005595; the Hellman Graduate Award; and the Philip Brett LGBT Studies Award. The research reported here does not represent the official views of the funding sources.

Contents of this article were included in a poster at The 145th Annual American Public Health Association Meeting and Exposition, November 7, 2017 in Atlanta, GA.

Human Participant Protection

This study does not constitute human subjects research, per the University of California, Berkeley Committee for the Protection of Human Subjects.

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Table 1. Number and weighted proportions of select demographics and alcohol consumption measures - BRFSS, selected states, 2014 and 2015

Variable	Black Women											
	Lesbian			Bisexual			Combined lesbian and bisexual			Heterosexual		
	n = 149			n = 217			n = 366			n = 12,835		
	n	%	SE	n	%	SE	n	%	SE	n	%	SE
Age												
18-24	18	29.2	0.06	48	37.9	0.05	66	35.0	0.04	636	12.7	<0.01
25-34	38	29.7	0.05	61	33.2	0.05	99	32.0	0.04	1307	16.5	<0.01
35-44	25	10.5	0.03	41	15.9	0.03	66	14.1	0.02	1760	18.0	<0.01
45-54	34	18.5	0.04	23	4.6	0.02	57	9.2	0.02	2439	18.2	<0.01
55-64	24	8.6	0.02	20	3.1	<0.01	44	4.9	<0.01	3139	17.6	<0.01
65+	10	3.6	0.02	24	5.3	0.02	34	4.7	0.01	3554	17.0	<0.01
Education												
< High school	12	11.1	0.04	25	20.7	0.05	37	17.5	0.04	1115	12.6	<0.01
High school	41	29.4	0.06	63	32.7	0.05	104	31.6	0.04	3745	29.9	<0.01
Some college or tech school	47	39.9	0.06	70	31.6	0.05	117	34.4	0.04	3977	35.8	<0.01
College degree	49	19.6	0.04	59	15.0	0.03	108	16.5	0.02	3967	21.5	<0.01
Refused	0	0.0	0.00	0	0.0	0.00	0	0.0	0.00	31	0.2	<0.01
Relationship status												
Married	24	10.4	0.03	30	9.5	0.03	54	9.8	0.02	3705	28.4	<0.01
Divorced	17	8.8	0.03	21	4.3	0.01	38	5.8	0.01	2500	13.9	<0.01
Widowed	2	0.7	<0.01	13	2.4	<0.01	15	1.8	<0.01	1985	10.0	<0.01
Separated	3	2.3	0.02	13	4.5	0.02	16	3.8	0.01	650	4.9	<0.01
Never married	94	74.6	0.04	123	72.7	0.04	217	73.3	0.03	3669	39.2	<0.01
Member of an unmarried couple	9	3.3	0.01	15	4.3	0.02	24	3.9	0.01	241	3.0	<0.01
Refused	0	0.0	0.00	2	2.4	0.02	2	1.6	0.02	85	0.6	<0.01
Alcohol measures												
Current drinker	80	51.6	0.06	118	52.8	0.05	198	52.4	0.04	4647	40.6	<0.01
Hed	29	27.0	0.06	53	26.7	0.05	82	26.8	0.04	895	9.1	<0.01
HED among current drinkers	29	52.3	0.08	53	50.5	0.07	82	51.1	0.05	895	22.5	<0.01

Variable	White Women											
	Lesbian			Bisexual			Combined lesbian and bisexual			Heterosexual		
	n = 1,614			n = 2,017			n = 3,631			n = 142,153		
	n	%	SE	n	%	SE	n	%	SE	n	%	SE
Age												
18-24	108	18.4	0.02	367	35.2	0.02	475	29.0	0.02	4244	9.0	<0.01
25-34	133	15.1	0.02	448	30.2	0.02	581	24.6	0.01	9417	12.6	<0.01
35-44	185	16.5	0.02	316	13.6	0.01	501	14.7	<0.01	14477	14.2	<0.01
45-54	387	22.6	0.02	275	8.7	<0.01	662	13.9	<0.01	23115	18.7	<0.01
55-64	472	17.3	0.01	287	6.2	<0.01	759	10.3	<0.01	34398	19.4	<0.01
65+	329	10.2	<0.01	324	6.1	<0.01	653	7.6	<0.01	56502	26.0	<0.01
Education												
< High school	36	6.0	0.02	112	11.6	0.02	148	9.6	0.01	6059	7.8	<0.01
High school	263	22.3	0.02	461	27.0	0.02	724	25.3	0.01	38006	28.6	<0.01
Some college or tech school	362	30.8	0.02	684	39.3	0.02	1046	36.2	0.01	41437	33.6	<0.01
College degree	952	40.7	0.02	759	22.0	0.01	1711	29.0	0.01	56408	30.0	<0.01
Refused	1	0.2	<0.01	1	0.0	<0.01	2	0.0	<0.01	243	0.2	<0.01
Relationship status												
Married	503	25.7	0.02	657	26.5	0.02	1160	26.2	0.01	76583	57.1	<0.01
Divorced	186	9.8	0.01	342	10.7	<0.01	528	10.4	<0.01	21260	11.6	<0.01
Widowed	49	1.6	<0.01	149	3.0	<0.01	198	2.5	<0.01	25584	11.3	<0.01
Separated	22	1.5	<0.01	61	3.3	<0.01	83	2.6	<0.01	1955	1.6	<0.01
Never married	532	39.5	0.02	609	43.9	0.02	1141	42.3	0.02	13545	15.3	<0.01
Member of an unmarried couple	310	21.3	0.02	192	12.2	0.01	502	15.5	<0.01	2660	2.9	<0.01
Refused	12	0.6	<0.01	7	0.4	<0.01	19	0.5	<0.01	565	0.3	<0.01
Alcohol measures												
Current drinker	984	63.6	0.02	1211	60.7	0.02	2195	61.7	0.01	72894	53.0	<0.01
HED	247	19.0	0.02	405	25.0	0.02	652	22.8	0.01	12471	11.8	<0.01
HED among current drinkers	247	30.0	0.03	405	41.1	0.02	652	36.9	0.02	12471	22.3	<0.01

BRFSS, Behavioral Risk Factor Surveillance System; HED, heavy episodic drinking; SE, standard error

Table 2. Age-adjusted prevalence differences of past 30-day heavy episodic drinking (HED), BRFSS, selected states, 2014 and 2015

Outcome	Black lesbian women compared to:		
	Black heterosexual PD (95% CI)	White lesbian PD (95% CI)	White heterosexual PD (95% CI)
HED	0.114 (0.026, 0.203)	0.019 (-0.062, 0.099)	0.063 (-0.022, 0.148)
HED among current drinkers	0.207 (0.063, 0.351)	0.133 (-0.013, 0.278)	0.173 (-0.001, 0.346)
Outcome	Black bisexual women compared to:		
	Black heterosexual PD (95% CI)	White bisexual PD (95% CI)	White heterosexual PD (95% CI)
HED	0.15 (0.024, 0.277)	0.04 (-0.055, 0.135)	0.139 (-0.005, 0.283)
HED among current drinkers	0.281 (0.113, 0.449)	0.144 (0.017, 0.271)	0.317 (0.122, 0.513)
Outcome	Black sexual minority women (combined lesbian and bisexual; "SMW") compared to:		
	Black heterosexual PD (95% CI)	White SMW PD (95% CI)	White heterosexual PD (95% CI)
HED	0.122 (0.042, 0.201)	0.033 (-0.035, 0.101)	0.102 (0.001, 0.209)
HED among current drinkers	0.245 (0.126, 0.365)	0.16 (0.054, 0.266)	0.272 (0.120, 0.424)

Boldface indicates statistical significance ($p < 0.05$); Age-adjusted using age categories: 18-24, 25-34, 35-44, 45-54, 55-64, 65+; Age-adjusted comparisons between black lesbians and other women include ages 18 - 64; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; PD, prevalence difference

Table 3. Age-adjusted excess prevalence^a of past 30-day heavy episodic drinking (HED) due to interaction^b, BRFSS, selected US states, 2014 and 2015

Black lesbian women						
Outcome	PD for SM status ^c	PD for Black race ^d	Expected PD ^a	Excess prevalence ^a due to interaction ^b		
				Excess	95% CI	80% CI
HED	0.047	-0.041	0.007	0.056	-0.033, 0.146	-0.002, 0.115
HED among current drinkers	0.049	-0.021	0.028	0.144	-0.036, 0.325	0.027, 0.262
Black bisexual women						
Outcome	PD for SM status ^c	PD for Black race ^d	Expected PD ^a	Excess prevalence ^a due to interaction ^b		
				Excess	95% CI	80% CI
HED	0.036	-0.027	0.009	0.129	-0.017, 0.275	0.034, 0.225
HED among current drinkers	0.048	-0.0005	0.047	0.27	0.066, 0.474	0.137, 0.403
Black sexual minority women (combined lesbian and bisexual)						
Outcome	PD for SM status ^c	PD for Black race ^d	Expected PD ^a	Excess prevalence ^a due to interaction ^b		
				Excess	95% CI	80% CI
HED	0.033	-0.027	0.006	0.096	-0.006, 0.199	0.030, 0.163
HED among current drinkers	0.038	-0.001	0.037	0.235	0.080, 0.390	0.134, 0.336

^a Compared to White heterosexual women; ^b Of race and sexual orientation identity; ^c Among White women; ^d Among heterosexual women; Boldface indicates statistical significance at alpha = 0.05 or 0.20 (customary for interaction analyses, See Jewell (2004)); Age-adjusted using age categories: 18-24, 25-34, 35-44, 45-54, 55-64, 65+; Age-adjusted comparisons between black lesbians and other women include ages 18 - 64; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; PD, prevalence difference; SM, sexual minority

Appendix for dissertation paper 2

States included

Alaska

Colorado

Delaware

Hawaii

Idaho

Indiana

Kansas

Maryland

Massachusetts

Michigan

Minnesota

Nevada

New Mexico

New York

North Carolina

Ohio

Pennsylvania

Virginia

Washington

Wisconsin

DISSERTATION PAPER 3

State-level structural stigma and sexual orientation inequities in self-rated health among women: Results of a cross-sectional analysis

Abstract

Objective: To examine the relationship between state-level structural stigma and sexual orientation inequities in self-rated health among women, and to assess modification of this relationship by race.

Methods: Cross-sectional data from 147,048 Black and White women who participated in the Behavioral Risk Factor Surveillance System in 2014 or 2015 were analyzed. Structural stigma was operationalized using an index that includes concentration of same-sex couples, state policies, proportion of secondary schools with a Gender and Sexuality Alliance, and public opinions. Adjusted prevalence differences of fair or poor self-rated health comparing sexual minority women to heterosexual women were estimated for each quartile of structural stigma among Black and White women separately and combined.

Results: Sexual minority women had worse health than heterosexual women in high stigma states (5.1% difference in prevalence), but not in low stigma states. The relationship between structural stigma and sexual orientation health inequities was similar for Black and White women.

Conclusions: Higher structural stigma is associated with greater sexual orientation health inequities. More research is necessary to better understand this relationship. Reducing structural stigma may reduce health inequities.

Introduction

Sexual minority (non-heterosexual) status is associated with health-harming behaviors and poor health outcomes.¹ For example, smoking, drug use, fair or poor health, poor mental health, and activity limitation are more common among sexual minorities than heterosexuals.²⁻⁷ Some explanations for these health inequities highlight the psychosocial stress, discrimination, and limited access to health-promoting resources experienced by sexual minorities.⁸⁻¹¹ Given this, the National Academy of Medicine suggests that research on the health of sexual minorities should incorporate stigma, including structural stigma.¹ As an expansion of earlier, more individual and interpersonal-focused conceptualizations of stigma, structural stigma “refers to societal-level conditions, cultural norms, and institutional practices that constrain the opportunities, resources, and wellbeing for stigmatized populations” (p 34).¹²

Existing literature investigating the relationship between structural stigma and health among sexual minorities is sparse and predominately focuses on mental health or substance use outcomes.¹³⁻¹⁷ For example, Hatzenbuehler et al. found a stronger relationship between sexual minority status and psychiatric morbidity in states with higher structural stigma.¹⁴ The rare studies considering measures of physical health include a study that reports no association between community-level anti-gay attitudes and mortality among sexual minorities, and a study that found a relationship between structural stigma and stress reactivity among sexual minorities.^{12,18,19} Therefore, the field would benefit from more research that directly examines physical health. In addition, given that the relationship between sexual orientation and some health outcomes varies by gender, the relationship between structural stigma and health inequities by sexual orientation may also vary by gender.^{2,4-7} However, we know of only two studies investigating structural stigma and health among sexual minorities that reported results for women.^{13,17}

Intersectionality is the concept that the experience of a given combination of privileged and marginalized identities (e.g., a White, sexual minority, working class, cisgender man) cannot be accurately characterized by considering the identities separately, or even in “sum.”²⁰ As intersectionality relates to public health, Bowleg explains that “multiple social identities at the micro level (i.e., intersections of race, gender, and [socioeconomic status] intersect with macrolevel structural factors (i.e., poverty, racism, and sexism),” leading to health inequities (p. 1268).²¹ One implication is that the relationship between sexual orientation-related structural stigma and health may depend on identities beyond solely sexual orientation, such as race, class, and gender. For example, structural stigma may be worse for the health of Black sexual minority women (SMW) than White SMW because it exacerbates existing barriers to health that Black SMW already face, unrelated to sexual orientation. Conversely, the presence of these additional barriers to health among Black SMW may mean that sexual orientation-specific barriers are of smaller additional consequence to Black SMW, compared to White SMW.¹³ However, we know of only one study that examined racial/ethnic differences in the relationship between structural stigma and health among sexual minorities.¹³ Findings from Everett et al.’s study among SMW in Illinois suggested that SMW of color experienced greater improvements in mental health than White SMW following the passage of civil union legislation.¹³

We build on existing research of the relationship between structural stigma and health by examining physical health, focusing on women, and assessing modification by race. Specifically, the present study has two objectives: 1) to investigate the relationship between state-level structural stigma inequities in self-rated health (an important indicator of mortality and morbidity) by sexual orientation among Black and White women combined, and 2) to analyze the relationship between state-level structural stigma and sexual orientation inequities in self-rated health separately for Black and White women.²²

Methods

Data Source

The United States' (US) Behavioral Risk Factor Surveillance System (BRFSS) is a nationally representative phone survey of non-institutionalized English- or Spanish-speaking adults ages 18 and older conducted annually by states and some territories, in partnership with the US Centers for Disease Control and Prevention (CDC). The present study included the 20 states (see Appendix) that administered either the optional BRFSS sexual orientation module or a state-added question about sexual orientation in both 2014 and 2015, and made data publicly available by December 2016. The present study restricted data to geographic strata that included at least one Black woman. BRFSS included 446,421 non-Hispanic Black and White women in 2014 and 2015; of the 183,867 women who resided in eligible states, 168,081 resided in eligible strata. For 2014 and 2015 combined, the median response rate for states included in this study was 45.5% (range: 33.0% - 57.6%).^{23,24}

Measures

Sexual orientation identity and race

The present study categorized respondents based on their self-identified sexual orientation. The CDC optional module asks: "Do you consider yourself to be: 1 Straight, 2 Lesbian or gay, 3 Bisexual?" Some state-added questions included one or more of the following variations: 1) offered the response options in a different order, 2) included the terms "heterosexual" and "homosexual" in addition to those above, 3) used letters instead of numbers preceding the response options, 4) explained the options by referencing sexual behavior and/or attraction, and 5) allowed interviewers to read aloud "Other" as an option. Women who selected homosexual, lesbian or gay, or bisexual were considered sexual minorities. Due to sample size, lesbian and bisexual women were analyzed together. The present study included women who reported being non-Hispanic and either Black or White.

Health outcome: self-rated health

Self-rated health is a valid and widely used measure of population health.²² Participants are asked: "Would you say that in general your health is: 1 Excellent, 2 Very good, 3 Good, 4 Fair, or 5 Poor?" Self-rated health was dichotomized as excellent, very good, or good versus fair or poor.

Exposure of interest: state-level structural stigma

The present study calculated state-level structural stigma for all 50 states separately for 2014 and 2015 based on a measure described by Hatzenbuehler et al.²⁵ This measure includes 4 components: 1) concentration of same-sex households, 2) public opinion about sexual minority-related policies, 3) presence or absence of five sexual minority-related policies, and 4) proportion of secondary schools with a Gender and Sexuality Alliance (GSA).

Component 1 methods: Concentration of same-sex households was estimated using 2010 United States Census data, and methodology detailed by Gates and Ost.^{26–28} Values above 1 indicate that same-sex partner households were overrepresented in that state. Because this measure is based on the decennial census data, values are the same for 2014 and 2015.

Component 2 methods: Public opinion about sexual minority-related policies was collected from Lax and Philips' published estimates.²⁹ Lax and Philips aggregated responses from 41 national polls conducted between 1999 and 2008 to estimate the proportion of state residents who supported each of eight pro-gay policies.²⁹ The present study included the published state-level mean value across the eight policies. This measure is based on a single published mean value, and thus values are the same for 2014 and 2015.

Component 3 methods: The policy component included the presence of: 1) employment non-discrimination policies that include sexual orientation, 2) hate crime policies that include sexual orientation, and 3) either a school non-discrimination policy that protects sexual minority students or an anti-bullying policy that includes sexual orientation; and the absence of: 1) a ban on same-sex marriage and 2) policies explicitly banning adoption by same-sex couples. Each policy was coded between 0 (not protective the whole year) and 1 (protective the whole year). States with employment protection for state employees only were coded as 0.5 for employment protection. For policies that were implemented during that year, values reflect the proportion of the year, rounded to the nearest month, that the policy was in effect. For example, a state whose ban on same-sex marriage was overturned in early October 2014 would be coded as 0.25 for marriage in 2014 and 1 for marriage in 2015. The US Supreme Court ruled in June 2015 that any remaining state-level bans on same-sex marriage were unconstitutional, effectively giving same-sex couples the right to marry in any state.³⁰ States with bans on same-sex marriage at the time of the Supreme Court ruling were coded as 0 for marriage to reflect the state-level environment for sexual minorities. Values for each policy were summed to create a total for the policy component.

Component 4 methods: The proportion of secondary schools with a GSA was obtained from 2014 and 2016 CDC School Health Profiles reports.^{31,32} Values for 2014 were taken directly from the reports. For 2015, proportions for 2014 and 2016 were averaged. Three states had a value for only one year (either 2014 or 2016), which was used for both 2014 and 2015.

Individual component values (i.e., concentration of same-sex households, public opinion, etc.) for each state-year (i.e., Alaska in 2014, Alaska in 2015, Colorado in 2014, Colorado in 2015, etc.) were standardized using the distribution of all 50 states. This allowed state-level structural stigma to be characterized relative to the nation as a whole instead of relative to only included states. To characterize structural stigma relative to the whole two-year time period, state-year values for components that were different by year (policies and proportion of secondary schools with a GSA) were standardized using the combined distribution of values for 2014 and 2015. Standardized state-year values for each component were then summed to create a structural stigma “score” for each state-year. Higher values of the score represent lower

structural stigma. Scores ranged from 7.35 (lowest structural stigma) to -4.51 (highest structural stigma). Scores for included state-years (i.e., 40 state-years) were sorted in descending order and split into quartiles, with “Quartile 1” including the 10 state-years with the lowest structural stigma (see Appendix for states in each quartile).

Participants

Analyses included participants with non-missing values for all categorization (race and sexual orientation identity) and outcome (self-rated health) variables; age group was available for all participants. Ninety percent (90%; n=151,673) of Black and White women in included strata had non-missing responses for sexual orientation identity. The present study excluded women who responded “other” or “something else” (n=507; 0.30%), “don’t know/not sure” (n=956; 0.57%), or who refused to answer the question (n=2,797; 1.66%).³³ Of the 147,413 Black and White women who reported a sexual orientation of heterosexual, lesbian, or bisexual, 365 (0.25%) were excluded due to missing the self-rated health item.

The present study does not constitute human subjects research, per the University of California, Berkeley Committee for Protection of Human Subjects.

Covariates

Analyses with Black and White women combined included age (18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 or older), race, and state-level income inequality as covariates. State-level income inequality was included as a proxy for unequal social environment more generally, which could be associated with sexual orientation-related structural stigma, as well as contribute to health inequalities between marginalized (i.e., sexual minorities) and privileged (i.e., heterosexuals) groups. Race-stratified analyses included age and state-level income inequality as covariates. Other common control variables (e.g., educational attainment, marital status, income) and health behaviors (e.g., smoking) were not included because they may mediate the relationship between structural stigma, sexual orientation, and self-rated health.^{34,35}

Statistical Analysis

Data weighting in BRFSS accounts for the sampling design, noncoverage and nonresponse, and makes each state’s data representative for that state. Since 2011, the CDC has used raking, or iterative proportional fitting, to weight BRFSS data. Analyses incorporated the BRFSS sample design stratification variable and raked weights using the survey package in Stata SE version 14.2, StataCorp, College Station, TX.

The adjusted prevalence difference (PD) for fair or poor health comparing SMW and heterosexual women was estimated within each structural stigma quartile. That is, PD₁ (lowest stigma), PD₂, PD₃, PD₄ (highest stigma), where PD₁ is the difference in prevalence of fair or poor self-rated health between SMW and heterosexual women in the lowest structural stigma

quartile and PD₄ is the difference in prevalence of fair or poor self-rated health between SMW and heterosexual women in the highest structural stigma quartile. To assess the relationship between state-level structural stigma and inequities in self-rated health associated with sexual orientation, the PD in the lowest structural stigma quartile was subtracted from the PD in the highest structural stigma quartile (i.e., $SS_{MOA} = PD_4 - PD_1$). This compares the relationship between sexual orientation and self-rated health in high structural stigma states to the relationship between sexual orientation and self-rated health in low structural stigma states. The above was implemented for 1) Black and White women combined, 2) Black women, and 3) White women.

To assess how race modified the relationship between structural stigma and sexual orientation inequities in self-rated health, the relationship between structural stigma and sexual orientation inequities in self-rated health among White women was subtracted from the relationship between structural stigma and sexual orientation inequities in self-rated health among Black women (i.e., $(PD_4 - PD_1)_{Black} - (PD_4 - PD_1)_{White}$).

Adjusted PDs were estimated using g-computation, which allows for comparisons on the additive scale.³⁶ Bootstrapping with 1000 repetitions provided 95% confidence intervals for adjusted prevalences, PDs, and differences between PDs. Eighty percent (80%) confidence intervals were also estimated for differences between PDs and analysis of modification by race, following common practice of a $p < 0.2$ criterion for effect modification.³⁷ Bootstrapping accounted for the survey sampling design by cluster sampling by strata.

Results

Table 1 presents descriptive information about study participants by structural stigma quartile. In adjusted analyses (Table 2), sexual orientation inequities in fair or poor health were larger in the highest structural stigma quartile than in the lowest structural stigma quartile. For Black and White women combined, this difference was statistically significant at $\alpha = 0.05$. Overall, SMW in the highest structural stigma quartile had 5.1 percentage points higher adjusted prevalence (PD = 0.051) of fair or poor health (24.3%) compared to heterosexual women (19.1%), while SMW in the lowest structural stigma quartile had similar adjusted prevalence of fair or poor health to heterosexual women (13.7% and 15.1%, respectively; PD = -0.014). Thus, the relationship between sexual orientation and fair or poor self-rated health was 6.5% (95% CI: 0% - 13.1%, 80% CI: 2.3% - 10.8%) stronger in the highest structural stigma quartile than in the lowest structural stigma quartile. The magnitude of the relationship between structural stigma and sexual orientation inequities in self-rated health was similar for Black (7.7%) and White women (6.2%).

Discussion

The present study used a probability sample and objective measure of structural stigma to investigate the relationship between structural stigma and sexual orientation inequities in

health among women. Results suggest that higher levels of state-level structural stigma are associated with larger sexual orientation inequities in self-rated health. These results are consistent with existing research on inequities in mental health and substance use among both adults and youth.^{14,17} Previous research found no relationship between structural stigma and mortality among sexual minorities.^{12,18} However, Hatzenbuehler et al. examined a more extreme physical health outcome of mortality and examined associations among sexual minorities rather than examining inequities by sexual orientation across levels of structural stigma.^{12,18} Notably, had we focused only on the association of structural stigma with self-rated health among the sexual minority women, we would have found worse health among SMW in states with high structural stigma than states with low structural stigma, suggesting that differences are more likely attributable to the outcome examined.

This is the first study to examine racial differences in the relationship between structural stigma and sexual orientation inequities in self-rated health. Theory and previous research suggest that the relationship could differ by race, however we found that associations were similar for Black women and White women.^{13,20}

Though not an original focus of the present study, higher state-level structural stigma was associated with worse self-rated health among White heterosexual women in adjusted analyses. This might indicate that other state-level factors that affect self-rated health and are related to state-level structural stigma are not accounted for by adjusting for income inequality. Other studies have also found a relationship between structural stigma and health among heterosexuals.^{12,38} However, it is unknown if the relationships were due to confounding or if structural stigma affects the health of people who are not members of the stigmatized group.

Limitations and Strengths

There are several limitations to this study. The range of structural stigma scores of the 20 included states does not span the full range of scores calculated for all 50 states. Specifically, structural stigma among included states was lower than among all states. The relationship between state-level structural stigma and sexual orientation inequities in self-rated health in the present study may not generalize to the US as a whole. The present study examined structural stigma at the state level only, but existing research demonstrates that structural stigma measured at the county-level within a state may also influence health inequities by sexual orientation.¹⁵ In addition, perhaps living in a low-structural stigma city or county provides some protection against high state-level structural stigma. This would be an interesting avenue for future research. Given the sample size, lesbian and bisexual women were analyzed together. However, previous research recommends separating lesbian and bisexual women when possible.^{2,5,33,39} It is important to note that the findings comparing Black and White women may not apply to other women of color. Finally, this study did not examine potential mechanisms in the relationship between structural stigma and health inequities between SMW and heterosexual women.

The present study also has several strengths. This study contributes to the field by using a measure that incorporates physical health, providing results for women, and examining modification by race. In addition, the structural stigma measure is distinct from individually experienced stigma, which adds to the larger understanding of stigma and health.

Implications and suggestions for further research

Findings suggest that, after adjusting for age and income inequality, higher state-level structural stigma is associated with greater health inequities between SMW and heterosexual women. Longitudinal data will improve understanding of the relationship between structural stigma and health among sexual minorities over the life course. For example, residential and health data over time are necessary to investigate differences in health associated with patterns of stigma exposure, such as length and timing.¹⁶ In addition, states with the same current policies, laws, and attitudes do not necessarily have the same history, and currently living in a state with a longer history of low structural stigma may not be comparable to living in a state that achieved the same structural stigma score in the past year.

The present study does not establish causality or investigate potential mechanisms. However, combined with existing research, the present study's results suggest that reducing structural stigma may reduce health inequities associated with sexual orientation.^{10,13,40} Future research should investigate and highlight effective ways to reduce structural stigma related to sexual orientation.⁴¹

Acknowledgements

I would like to thank Jennifer Ahern, Catherine Duarte, Kriszta Farkas, Dana Goin, Ellie Matthay, Helen Pitchik, and Marilyn Thomas for providing feedback on earlier drafts, as well as Alan Hubbard for bootstrapping analysis guidance and Mark Hatzenbuehler for consultation regarding the structural stigma measure. Dana Goin also provided income inequality data. Karen Trocki and Tonda Hughes provided consultation regarding prior research among sexual minority women. In addition, I acknowledge the state BRFSS programs and coordinators in Alaska, Colorado, Massachusetts, Michigan, New Mexico, North Carolina, and Washington for providing data that was not available through the Centers for Disease Control and Prevention. Finally, this work would not have been possible without the BRFSS participants.

Emily M. Yette was supported by the National Institute on Alcohol Abuse and Alcoholism: Graduate Research Training on Alcohol Problems, award number T32AA007240 and Center grant P50AA005595; the Hellman Graduate Award; and the Philip Brett LGBT Studies Award. The research reported here does not represent the official views of the funding sources.

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Table 1. Number and weighted proportions of select demographics and SRH by SS quartile^a - BRFSS, selected states: 2014, 2015

Variable	SS Quartile 1		SS Quartile 2		SS Quartile 3		SS Quartile 4		Total	
	n = 34,931		n = 38,610		n = 29,605		n = 43,902		N = 147,048	
	n	%	n	%	n	%	n	%	n	%
Sexual minority^b	1,163	4.2%	958	3.7%	657	2.9%	948	3.5%	3,726	3.5%
Black race	2,739	13.6%	3,607	16.8%	4,224	16.2%	2,860	12.2%	13,430	14.6%
Age										
18-24	1,165	9.7%	1,204	9.5%	1,138	10.8%	1,658	11.1%	5,165	10.4%
25-34	2,442	13.8%	2,757	14.0%	2,314	13.3%	3,222	14.1%	10,735	13.7%
35-44	3,511	14.7%	4,324	15.4%	3,362	14.5%	4,540	15.1%	15,737	14.8%
45-54	5,901	18.6%	6,626	19.0%	5,115	18.7%	6,951	18.0%	24,593	18.5%
55+	21,912	43.2%	23,699	42.1%	17,676	42.7%	27,531	41.8%	90,818	42.5%
Education										
< High school	1,328	6.5%	1,376	7.3%	1,889	9.9%	2,237	9.5%	6,830	8.6%
High school	8,017	25.9%	9,368	24.6%	8,815	30.6%	13,217	31.2%	39,417	28.7%
Some college or tech school	9,900	33.3%	11,554	35.7%	8,223	32.3%	13,062	35.5%	42,739	33.8%
College degree	15,603	34.2%	16,227	32.3%	10,627	27.1%	15,317	23.7%	57,774	28.8%
Refused	83	0.2%	85	0.2%	51	0.2%	69	0.1%	288	0.2%
Relationship status										
Married	16,698	50.5%	20,407	53.3%	14,836	51.7%	22,783	51.8%	74,724	51.6%
Divorced	5,715	11.6%	5,834	12.3%	4,293	11.2%	6,694	12.5%	22,536	11.8%
Widowed	5,852	10.2%	6,346	10.1%	5,192	11.3%	8,167	11.0%	25,557	10.8%
Separated	664	2.2%	614	1.9%	698	2.5%	591	1.7%	2,567	2.1%
Never married	4,882	21.3%	4,400	19.0%	3,877	20.0%	4,680	19.5%	17,839	20.1%
Member of an unmarried couple	910	3.7%	850	3.2%	582	3.1%	813	3.2%	3,155	3.3%
Refused	210	0.5%	150	0.3%	127	0.4%	173	0.4%	660	0.4%
Missing	0		9		0		1		10	
Fair or poor SRH	5,302	14.0%	5,576	13.2%	5,415	17.1%	7,882	17.3%	24,175	15.8%

^aHigher SS quartiles indicate more sexual orientation-related structural stigma; ^bLesbian or bisexual sexual orientation identity; BRFSS, Behavioral Risk Factor Surveillance System; SRH, self-rated health; SS, structural stigma

Table 2. Adjusted prevalences, prevalence differences, and comparison of prevalence differences - BRFSS, selected states: 2014, 2015

	# of SMW	Prevalence of fair or poor SRH		SOI-related PD within SS quartile ^a	PD in highest SS quartile vs PD in lowest SS quartile ^a	
		Lesbian and bisexual	Heterosexual		Difference in PDs (95% CI)	80% CI
		Prev (95% CI)	Prev (95% CI)	PD (95% CI)		
Black and White women combined^b						
SS quartile ^a						
1	1,163	0.137 (0.099, 0.175)	0.151 (0.144, 0.158)	-0.014 (-0.052, 0.023)	0.065 (0.000, 0.131)	0.023, 0.108
2	958	0.159 (0.126, 0.192)	0.140 (0.134, 0.146)	0.019 (-0.014, 0.052)		
3	657	0.228 (0.172, 0.283)	0.184 (0.178, 0.191)	0.043 (-0.012, 0.098)		
4	948	0.243 (0.192, 0.293)	0.191 (0.185, 0.198)	0.051 (0.001, 0.101)		
Black women^c						
SS quartile ^a						
1	99	0.298 (0.132, 0.465)	0.252 (0.218, 0.287)	0.046 (-0.115, 0.207)	0.077 (-0.155, 0.308)	-0.074, 0.227
2	93	0.201 (0.088, 0.313)	0.196 (0.172, 0.220)	0.005 (-0.104, 0.113)		
3	96	0.423 (0.195, 0.651)	0.260 (0.240, 0.279)	0.163 (-0.064, 0.391)		
4	89	0.396 (0.231, 0.562)	0.274 (0.247, 0.301)	0.122 (-0.040, 0.285)		
White women^c						
SS quartile ^a						
1	1,064	0.118 (0.082, 0.155)	0.141 (0.134, 0.148)	-0.023 (-0.058, 0.013)	0.062 (-0.004, 0.127)	0.019, 0.105
2	865	0.161 (0.124, 0.197)	0.135 (0.129, 0.141)	0.026 (-0.010, 0.062)		
3	561	0.198 (0.153, 0.244)	0.178 (0.171, 0.184)	0.021 (-0.025, 0.066)		
4	859	0.222 (0.170, 0.275)	0.183 (0.176, 0.190)	0.039 (-0.013, 0.091)		

^a Higher SS quartiles indicate more sexual orientation-related structural stigma ; ^b Adjusted for age, race, and state-level income inequality; ^c Adjusted for age and state-level income inequality; BRFSS = Behavioral Risk Factor Surveillance System; CI, confidence interval; PD, prevalence difference; Prev, Prevalence; SOI, sexual orientation identity; SRH, self-rated health; SS, structural stigma

Appendix for dissertation paper 3

States included

Alaska
Colorado
Delaware
Hawaii
Idaho
Indiana
Kansas
Maryland
Massachusetts
Michigan
Minnesota
Nevada
New Mexico
New York
North Carolina
Ohio
Pennsylvania
Virginia
Washington
Wisconsin

Structural stigma quartiles

1 (lowest structural stigma): Colorado (2015), Delaware, Massachusetts, Nevada (2015), New York, Washington

2: Colorado (2014), Hawaii, Maryland, Minnesota, Nevada (2014), New Mexico

3: Alaska (2015), Indiana (2015), North Carolina, Pennsylvania, Virginia, Wisconsin

4 (highest structural stigma): Alaska (2014), Idaho, Indiana (2014), Kansas, Michigan, Ohio

Overall conclusions

Results of the first and second studies suggest that Black SMW generally experience worse HRQOL and higher prevalence of heavy episodic drinking than Black heterosexual women and White heterosexual women; results comparing Black SMW and White SMW were more complex. These findings highlight the need for further research that will improve understanding and inform prevention and intervention efforts. Investigating specific health conditions, behaviors, and mechanisms that are influencing inequities in HRQOL and HED could provide guidance on specific points of prevention and intervention. In addition, results suggest that potential differences between lesbian and bisexual women should be further explored. For example, the relationship between race and HRQOL within SMW was generally consistent for lesbian women, but was mixed for bisexual women. And, though heavy episodic drinking conclusions were the same for Black lesbian and Black bisexual women, the magnitudes of association were substantially larger for Black bisexual women than for Black lesbian women (although differences were not statistically significant, possibly due to small sample size). Health-related behaviors, experiences of stigma and support, and other determinants of health may vary between lesbian and bisexual women, which may have implications for prevention and intervention.¹⁻⁵

The presence of additive interaction between sexual orientation and race suggests that individual associations between social identities and health cannot be summed to predict the health of a particular group. This not only supports the need to directly measure the health of Black SMW, but also suggests that prevention and intervention efforts for Black SMW need an intersectionality-informed lens. Some aspects of work to improve health among Black SMW may be unique, and not clearly discerned from research focused on SMW overall or Black women overall. For example, it is unclear to what degree Black SMW participate in, and are influenced by, the factors that limit alcohol use among Black women overall. The results of the interaction analyses also suggest that while prevention and intervention efforts targeted toward Black women overall or SMW overall may reach some Black SMW, the actual results for Black SMW may not be as expected. Therefore, additional work focused on Black SMW, including qualitative work, could elucidate the best ways to improve health among Black SMW.

To the degree that societal structures and power differentials contribute to the patterns of health inequities found in studies one and two, multi-level interventions and overarching social change are crucial to addressing these patterns.^{6,7} Results of the third study support this idea. Combined with existing research, results of the third study suggest that reducing structural stigma may reduce health inequities associated with sexual orientation.⁸⁻¹⁰ Longitudinal studies would improve understanding of the relationship between structural stigma and sexual orientation health inequities, as well as understanding of the mechanisms and consequences related to the health inequities experienced by Black SMW.

Finally, the small number of Black SMW in the analytic sample, and the underrepresentation of some geographic regions of the United States, highlight the need for large national surveys that

collect sexual orientation information. Larger sample sizes would contribute to more confidence in findings, help identify differences between Black lesbian and Black bisexual women, and allow for important exploration of additional heterogeneity relevant to health among Black SMW, such as educational attainment. In addition, wider geographic coverage would both improve generalizability and allow comparisons between geographic regions.

Limitations and strengths

This dissertation had several limitations. Twenty states were eligible for inclusion, therefore, results may not generalize to the United States as a whole. For instance, the drinking cultures and the state-level structural stigma of included states do not represent that of the whole United States.¹¹ In addition, the findings may not represent health among women who self-identify as sexual minorities, but use a term other than “lesbian” or “bisexual” (e.g., “same gender loving” or “queer”) and therefore selected “other” or “something else,” or women who experience same-sex attractions or sexual encounters but identify as heterosexual.¹² This dissertation did not address other potential sources of heterogeneity, or intersectionality, such as age and class, within the relationships examined. Given the sample size, lesbian and bisexual women were analyzed together for the structural stigma study, even though previous research recommends separating lesbian and bisexual women when possible.^{1-3,12}

This dissertation also had several strengths. This dissertation used a general population sample, utilized outcome measures identified by Healthy People 2020 as relevant to population health, and assessed for additive interaction between sexual orientation and race. In addition, this dissertation focused on Black SMW, an understudied population.

In conclusion, findings suggest that the health of Black SMW warrants further attention. Knowledge of health-related behaviors and outcomes among Black SMW cannot be fully inferred from research among other women. In addition, heterogeneity within Black SMW should be investigated. Further, multilevel, intersectionality-informed prevention and intervention efforts should be explored.

References for overall conclusions

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