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Journal of Health Disparities Research and Practice

Volume 13 | Issue 4 Article 5

2020

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Abstract

Purpose Studies examining binge drinking disparities by sexual identity focus on intra- and inter-personal minority stressors experienced by lesbian, gay, and bisexual (LGB) populations. State-level statutes are powerful tools that can reduce health disparities. We examined how state-level nondiscrimination statutes that include sexual orientation as a protected ground (i.e., inclusive statutes) are associated with binge drinking disparities between LGB and straight adults. Methods We combined data from the 2015-2018 Behavioral Risk Factor Surveillance System (BRFSS), the Movement Advancement Project (MAP), and administrative data sources for information on binge drinking, sexual identity, nondiscrimination statutes, and individual and state-level factors. We included an interaction term in the logistic regression models to test whether inclusive nondiscrimination statutes modify the association between sexual identity and binge drinking. Results Inclusive statutes modified the association between sexual identity and binge drinking among women, but not men. In states without inclusive statutes, the odds of binge drinking among lesbian [1.71 (95%CI: 1.27–2.31)] and bisexual [1.83 (95% CI: 1.54–2.17)] women were significantly higher compared with straight women. In states with inclusive statutes, the odds of binge drinking comparing lesbian and straight women were not significantly different [1.19 (95% CI: 0.92–1.53)]. The odds ratio for binge drinking comparing bisexual and straight women was 26.8% lower in states with [1.34 (95% CI: 1.13–1.60)] versus states without inclusive statutes. Conclusions The enactment of nondiscrimination statutes inclusive of sexual orientation at the state-level are associated with narrower binge drinking disparities between lesbian, bisexual, and straight women.

Keywords

Behavioral Risk Factor Surveillance System (BRFSS); Binge Drinking; Bisexual; Legal Epidemiology; Lesbian; Structural Stigma

Cover Page Footnote

Declaration of Interest: The authors have no financial interests to disclose. Funding: Naomi Greene was supported by NCI National Research Service Award T32 CA009314 Ethical Statement This study uses de-identified, publicly available data from the Behavioral Risk Factor Surveillance System. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board determined that this study did not qualify as human subjects research as defined by DHHS regulations 45 CFR 46.102 and did not require IRB oversight.

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Journal of Health Disparities Research and Practice
Volume 13, Issue 4, Winter 2020, pp. 46-66

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Are Binge Drinking Disparities by Sexual Identity Lower in U.S. States with Nondiscrimination Statutes that Include Sexual Orientation?

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ABSTRACT

Purpose Studies examining binge drinking disparities by sexual identity focus on intra- and inter-personal minority stressors experienced by lesbian, gay, and bisexual (LGB) populations. State-level statutes are powerful tools that can reduce health disparities. We examined how state-level nondiscrimination statutes that include sexual orientation as a protected ground (i.e., inclusive statutes) are associated with binge drinking disparities between LGB and straight adults.

Methods We combined data from the 2015-2018 Behavioral Risk Factor Surveillance System (BRFSS), the Movement Advancement Project (MAP), and administrative data sources for information on binge drinking, sexual identity, nondiscrimination statutes, and individual and state-level factors. We included an interaction term in the logistic regression models to test whether inclusive nondiscrimination statutes modify the association between sexual identity and binge drinking.

Results Inclusive statutes modified the association between sexual identity and binge drinking among women, but not men. In states without inclusive statutes, the odds of binge drinking among lesbian [1.71 (95%CI: 1.27–2.31)] and bisexual [1.83 (95% CI: 1.54–2.17)] women were significantly higher compared with straight women. In states with inclusive statutes, the odds of binge drinking comparing lesbian and straight women were not significantly different [1.19 (95% CI: 0.92–1.53)]. The odds ratio for binge drinking comparing bisexual and straight women was 26.8% lower in states with [1.34 (95% CI: 1.13–1.60)] versus states without inclusive statutes.

Conclusions The enactment of nondiscrimination statutes inclusive of sexual orientation at the state-level are associated with narrower binge drinking disparities between lesbian, bisexual, and straight women.

Keywords: Behavioral Risk Factor Surveillance System (BRFSS); Binge Drinking; Bisexual; Legal Epidemiology; Lesbian; Structural Stigma

INTRODUCTION

Sexual identity disparities in binge drinking are well-documented and show important sex differences (Drabble, Midanik, & Trocki, 2005; Gonzales, Przedworski, & Henning-Smith, 2016; Medley et al., 2016). The literature consistently shows that sexual minority women, including those who identify as lesbian or bisexual and those who identify as heterosexual with female partners, are more likely to binge drink (Gonzales & Henning-Smith, 2017; Gonzales et al., 2016; Medley et al., 2016) and drink more per binge compared with heterosexual women (Fish, 2019; Fish, Hughes, & Russell, 2018). Studies comparing gay and bisexual men to heterosexual men have been more varied. Some show that gay and bisexual men are more likely to binge drink (Gonzales et al., 2016) while others show gay and bisexual men have the same or lower odds of binge drinking (Caceres et al., 2018; Gonzales & Henning-Smith, 2017).

Previous studies posit that the higher binge drinking prevalence and alcohol-related harms among lesbian, gay, and bisexual (LGB) populations is due to minority stress (Bryan, Kim, & Fredriksen-Goldsen, 2017; English, Rendina, & Parsons, 2018; Wilson, Gilmore, Rhew, Hodge, & Kaysen, 2016; Wray, Pantalone, Kahler, Monti, & Mayer, 2016) – the excess stress experienced by LGB individuals as a result of discrimination, prejudice, and homophobia (Meyer, 2003). Qualitative studies reveal that lesbian and bisexual women may self-medicate with alcohol to cope with negative life stressors including homophobia and other traumatic experiences (Drabble & Trocki, 2014). Quantitative studies have found cross-sectional associations between minority stress and alcohol use among gay and bisexual men (Stall et al., 2001), and longitudinal associations between minority stress and alcohol-related consequences among lesbian and bisexual women (Wilson et al., 2016). The minority stress model posits how the internalization of homophobic attitudes and interpersonal experiences of prejudice and discrimination increase stress which results in health disparities among LGB populations. However, the model is limited in theorizing about larger policy and structural issues facing LGB populations. Few studies have examined how macro-level factors, such as public policy, reinforce structural stigma which can increase minority stress and how this may be associated with binge drinking disparities.

Posited by Link and Phelan, structural stigma is a phenomenon whereby powerful actors use social structures, including laws, to persecute a less powerful group (Link & Phelan, 2001). This process involves labeling, stereotyping, separating, and employing discrimination to inflict social status loss and reinforce power differentials between majority and minority groups (Link & Phelan, 2001). Because structural stigma is all-encompassing and affects multiple health outcomes among LGB populations, Hatzenbuehler, Link and Phelan have argued that it is a fundamental cause of disease and health disparities alongside socioeconomic position (Hatzenbuehler, Phelan, & Link, 2013).

Public policies are powerful tools that can influence stigma against LGB populations and subsequent minority stress. Some evidence exists showing that discriminatory state polices on the basis of sexual orientation, such as state-bans on same sex marriage, are associated with worse health outcomes among LGB populations (Hatzenbuehler, Keyes, & Hasin, 2009; Hatzenbuehler, McLaughlin, Keyes, & Hasin, 2010; Raifman, Moscoe, Austin, Hatzenbuehler, & Galea, 2018),

whereas protective policies, such as nondicrimination protections that include sexual orientation, improve health among this population (Everett, Hatzenbuehler, & Hughes, 2016; Hatzenbuehler et al., 2012; Raifman, Moscoe, Austin, & McConnell, 2017). Hatzenbuehler and colleagues found that the odds of mood and substance use disorders was significantly higher among LGB adults living in states without protections for employment discrimination or hate crimes (Hatzenbuehler et al., 2009). An early study on marriage equality bans shows that LGB adults who lived in states with the bans had a significantly higher prevalence of generalized anxiety disorders and alcohol use disorders (Hatzenbuehler et al., 2010). A more recent study shows that LGB adults living in states without protections for discrimination in public accommodations have a significantly higher prevalence of mental distress compared with LGB adults in states with these protections (Raifman et al., 2018). By contrast, when Massachusetts enacted marriage equality in 2003, the state saw significant decreases in average mental health expenditures of $305 among gay and bisexual men regardless of whether men had partners, an indication that policies destigmatizing same-sex relationships were protective for mental health (Hatzenbuehler et al., 2012).

Although the evidence linking state laws with LGB health outcomes is compelling, it is primarily focused on mental health, including alcohol use disorder. While almost all individuals with an alcohol use disorder engage in binge drinking, an estimated 90% of binge drinkers do not meet criteria for this diagnosis (Esser et al., 2014). As evidenced above, state-level policies, such as nondiscrimination laws that include sexual orientation, have the power to improve health outcomes among LGB populations by reducing structural stigma and minority stressors. The presence of nondiscrimination legislation inclusive of sexual orientation may be a signal of less structural stigma and more acceptance of LGB identities. More accepting environments, in turn, may prevent individuals from engaging in maladaptive coping behaviors such as binge drinking, to cope with these excess stressors. Therefore, understanding how nondiscrimination state laws inclusive of sexual orientation influence binge drinking disparities among LGB adults is important in developing and implementing these primary prevention efforts.

We examined the association between sexual identity, state-level nondiscrimination statutes, and binge drinking among US adults. This study builds on a growing body of research demonstrating associations between policy and disparities in mental health and alcohol use disorders among LGB populations. We hypothesized that the presence of state statutes that include protections on the basis of sexual orientation in employment, housing, and public accommodations (i.e., inclusive state statutes) modifies the positive association between sexual identity and binge drinking, resulting in lower binge drinking disparities between LGB adults and heterosexual adults in states with inclusive statutes.

METHODS

Data

We used the 2015-2018 Behavioral Risk Factor Surveillance System (BRFSS), a repeated cross-sectional survey overseen by the Centers for Disease Control and Prevention (CDC). Each US state collects information from state residents about health behaviors via telephone including landlines and cellphones. Multistage sampling and random digit dialing are used to produce representative samples of state residents age 18+ years (“BRFSS Data User Guide,” 2013).

Sample

From 2015-2018, 35 states used the optional Sexual and Gender Identity (SOGI) module in at least one year. Three states used the module in only one year (Colorado, Kentucky, Tennessee). Ten states used the module in two years (California, Florida, Iowa, Kansas, Maryland, Montana, North Carolina, Oklahoma, South Carolina, West Virginia). Ten states used the module in three years (Georgia, Idaho, Indiana, Louisiana, Massachusetts, Mississippi, Missouri, Rhode Island, Vermont, Washington). Twelve states used the module in all four years (Connecticut, Delaware, Hawaii, Illinois, Minnesota, Nevada, New York, Ohio, Pennsylvania, Texas, Virginia, Wisconsin). The unweighted sample size from 35 states in the analysis was 484,966 women and 378,291 men, and covers all four regions of the nation.

Measures

Sex: In 2015, participant sex in BRFSS was collected using vocal timbre. Between 2016-2017, participant sex was ascertained using the question "Are you (1) male (2) female?" In 2018, BRFSS changed the question for collecting information about sex. States could choose between two formats: (1) What is your sex? (2) What was your sex at birth? The publicly available BRFSS dataset does not distinguish between which states used which format for the sex question in 2018.

*Sexual Identity***:** Participants were asked "Do you consider yourself to be?" with the following response options: Straight, Lesbian or Gay, Bisexual, or Something Else. Individuals who identified as 'something else', 'don't know', or 'refused' or who were missing information were excluded from the analysis (women: 15.4%; men: 16.3%).

*Binge Drinking***:** Participants were asked: "Considering all types of alcoholic beverages, how many times during the past 30 days did you have X [X = 5 for men, X = 4 for women] or more drinks on an occasion." Participants who answered that they engaged in this behavior one or more times were classified as binge drinkers. This is the definition of binge drinking according to the National Institute on Alcohol Abuse and Alcoholism. (National Institute on Alcohol Abuse and Alcoholism, n.d.).

Inclusive nondiscrimination state statutes: The effect measure modifier for this analysis was whether a state included sexual orientation in their nondiscrimination laws for employment, housing, and public accommodations. We compared information extracted from the Human Rights Campaign's (HRC) State Equality Index reports with information extracted from the Movement Advancement Project (MAP) online reports. Both organizations track state policies over time to assess whether they are inclusive of sexual and gender minority populations. MAP's reports on the presence of inclusive nondiscrimination laws in states were downloaded and data extracted in September 2019 (Movement Advancement Project, 2019a, 2019b, 2019c). The information in these reports was current as of January 2019. HRC's State Equality Index reports for laws enacted between 2015 and 2018 were downloaded and data extracted in October 2019 (Sarah Warbelow & Diaz, n.d.; Sarah Warbelow, Oakley, & Kutney, n.d.; Sarah Warbelow & Persad, 2016; Sararh Warbelow & Diaz, 2017). MAP and HRC provide the most comprehensive legal surveillance on policies impacting LGB communities. Reports from the Williams Institute at the UCLA School of Law rely on data provided from the Movement Advancement Project to estimate the number of LGBT people living in states without nondiscrimination protections (Conron & Goldberg, 2020). A peer-reviwed study examining the association between nondiscrimination statutes and general health used legal research from HRC (Gonzales & Ehrenfeld, 2018).

Our exploratory analyses show that there was complete agreement between HRC and MAP on whether a state had inclusive nondiscrimination laws in employment, housing, and public accommodations. States that had inclusive nondiscrimination laws in employment also had inclusive nondiscrimination laws in housing and public accommodations. Additionally, states included in this analysis neither enacted nor repealed nondiscrimination statutes inclusive of sexual orientation during the study period; the sexual orientation protections in these statutes remained stable during the study period. Therefore, we treated this as a binary variable coded 1 for the presence of inclusive laws and coded 0 for the absence of inclusive laws from 2015 through 2018.

LGB Adults per State: Data from the Williams Institute, a research institute examining how law and public policy impact LGBT equity, provided the estimated number of LGB adults (18+ years) for each state using the 2017 Gallup Tracking poll (Conron & Goldberg, 2019). We divided the estimated number of LGB adults by the 2017 state population 5-year estimates to get the percentage of LGB adults in each state. We hypothesized that a larger proportion of LGB adults living in a state may provide greater access to LGB community spaces for LGB individuals in those states.

State-level variables: Covariates were chosen *a priori* for their potential association with both binge drinking and the state policy environment. Information about state composition came from the American Community Survey (U.S. Census Bureau, 2019a, 2019b, 2019c). For 2015, 2016, and 2017, we used 5-year estimates. The latest data for 2018 were 1-year estimates. State composition variables included the percentage of the population age 21 years and older (i.e., adults who are legally permitted to drink), that are adult males, and that are Non-Hispanic White, as well as median household income. The percentage of a state's population living in urban areas was extracted from the 2010 Census summary file (U.S. Census Bureau, 2011, 2012). We included a measure of Catholic adherents per 1,000 population, from the U.S. Religion Census Religious Congregations and Membership Study (Grammich et al., 2018). This measure has been used in previous studies because states with a higher prevalence of Catholics have higher binge drinking prevalence compared to states with fewer Catholics (Holt, Miller, Naimi, & Sui, 2006). State region (i.e., Northeast, Midwest, South, and West) was determined by the US Census Bureau (U.S. Census Bureau, n.d.).

*Individual-level variables***:** Individual demographic characteristics came from the BRFSS. All variables were categorical. These included age (18–24, 25–34, 35–44, 45–54, 55–64, 65+ years); sex (female, male); race-ethnicity (i.e., Hispanic/Latino, any race and Non-Hispanic White, Black,, Multi-racial, and Other); education level (less than high school, high school graduate, some college, college graduate); household income (<$15K; $15–24,999; $25–34,999; $35–49,000; $50K plus); and "marital status" (married, divorced, widowed, separated, never married, member of unmarried couple).

Statistical Analyses

Data from all sources were combined in R Version 3.6.1 (2019-07-05)._Final survey weights were divided by the number of years a state contributed data as the purpose of combining years was to increase sample size rather than conduct trend analysis. We used logistic regression to model the association between sexual identity and binge drinking stratified by sex. We tested for differences in the association between sexual identity (i.e., lesbian/gay, bisexual, straight) and binge drinking by presence of inclusive state statutes with an interaction term between sexual identity and a binary indicator of whether a state had inclusive statutes during the period. We

present stratified models for analyses where the interaction term was significant. All statistical models were built in SAS 9.4 using PROC SURVEYLOGISTIC to account for the complex sampling design.

RESULTS

Prevalence of Binge Drinking in States based on Statutes

Overall, the prevalence of binge drinking among women was higher in states with inclusive nondiscrimination statutes than in states without these statutes (12.8% vs 11.0%; p<0.01, Table 1).

Table 1: Prevalence of binge drinking among women and men by sexual identity comparing states with inclusive nondiscrimination statutes for sexual orientation to states without inclusive statutes, BRFSS, 2015-2018

		States with inclusive statutes[1]		States without inclusive statutes[2]		
	Unweighted sample size	Weighted %	95% CI	Weighted %	95% CI	p-value
All women	484,966	12.8	12.5 – 13.1	11.0	10.7 – 11.3	< 0.01
Straight women	413,205	11.9	11.6 – 12.3	10.0	9.7 – 10.3	< 0.01
Lesbian women	4,951	18.1	15.0 – 21.7	22.0	17.9 – 26.6	0.16
Bisexual women	8,875	23.8	21.5 – 26.3	24.4	21.8 – 27.3	0.74
All men	378,291	22.9	22.5 – 23.3	21.4	21.0 – 21.8	< 0.01
Straight men	318,494	22.3	21.8 – 22.8	20.7	20.3 – 21.1	< 0.01
Gay men	6,952	27.3	24.4 – 30.4	23.4	20.6 – 26.4	0.07
Bisexual men	4,814	26.0	22.7 – 29.7	24.9	21.3 – 28.8	0.67

[1]: California, Colorado, Connecticut, Delaware, Hawaii, Illinois, Iowa, Maryland, Massachusetts, Minnesota, Nevada, New York, Rhode Island, Vermont, Washington, Wisconsin

[2]: Florida, Georgia, Idaho, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia

There was no statistically significant difference in the prevalence of binge drinking in states with versus without inclusive statutes among lesbian women (18.1% vs 22.0%; p=0.16) and bisexual women (23.8% vs 24.4%; p=0.74). The prevalence of binge drinking among straight women was significantly higher in states with vs without inclusive statutes (11.9% vs 10.0%; p<0.001). Differences in binge drinking prevalence among women varied widely across states and

by sexual identity (Supplemental Table A.1). Binge drinking prevalence was highest among bisexual women in Missouri (39.1%) and lesbian women in Oklahoma (33.7%). Among straight women, the highest binge drinking prevalence was in Wisconisn (17.2%), but still lower than binge drinking prevalence among bisexual and lesbian women in many states.

Overall, the prevalence of binge drinking among men was significantly higher in states with inclusive statutes compared with states without inclusive statutes (22.9% vs 21.4%; p<0.01 ; Table 1).This pattern was seen for straight, gay, and bisexual men. However, among gay and bisexual men, the difference in binge drinking prevalence between states with and without inclusive statutes was not statistically significant. Among men, differences in binge drinking prevalence did not vary widely across states or by sexual identity (Supplemental Table A.2).

Risk for Binge Drinking Based on Statutes

The composition of states differed by whether the state did or did not have inclusive nondiscrimination statutes (Table 2).

Table 2: State-level covariates by presence of inclusive statutes

	States with inclusive statutes[1] (N=16)	**States without inclusive statutes[2] (N=19)**	
	Mean (SD)	**Mean (SD)**	**Two-sample t-test p-value**
Population 21+ years	73.8 (1.11)	72.5 (1.89)	<0.01
Population adult male	48.8 (0.83)	48.6 (0.61)	0.18
Population Non-Hispanic White	52.6 (14.2)	55.0 (10.5)	0.34
Population lesbian, gay, or bisexual	4.2 (0.56)	3.5 (0.46)	<0.01
Median household income ($)	64,174 (7,388)	52,472 (6,502)	<0.01
Population living in urban area	82.4 (13.8)	71.2 (10.4)	<0.01
Population living in rural area	17.6 (13.8)	28.8 (10.4)	<0.01
Catholic adherents per 1,000 population	253 (96.1)	124 (76.0)	<0.01
Census region	**Percent (n)**	**Percent (n)**	**Fisher's exact p-value**
Northeast	31.2 (5)	5.3 (1)	<0.01
Midwest	25.0 (4)	21.1 (4)	
South	12.5 (2)	63.2 (12)	
West	31.2 (5)	10.5 (2)	

[1]: California, Colorado, Connecticut, Delaware, Hawaii, Illinois, Iowa, Maryland, Massachusetts, Minnesota, Nevada, New York, Rhode Island, Vermont, Washington, Wisconsin

[2]: Florida, Georgia, Idaho, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia

On average, the proportion of the population living in urban areas was significantly higher in states with inclusive statutes compared to states without inclusive statutes (82.4% vs 71.2%; p<0.01). A significantly higher proportion of individuals identifying as lesbian, gay, or bisexual lived in states with inclusive statutes compared with states without inclusive statutes (4.2% vs 3.5%; p<0.01). States with inclusive statutes had significantly higher median income, proportion of the population of legal drinking age, and Catholic adherents per 1,000 population compared to states without inclusive statutes. States without inclusive nondiscrimination statutes were more likely to be in the South compared to states with inclusive statutes (63.2% vs 12.5%; p=< 0.01).

There was a statistically significant interaction between the presence of inclusive statutes and sexual identity for lesbian women (p=0.01; data not shown) and bisexual women (p=0.03; data not shown). Among women, the association between binge drinking and sexual identity differed between states with inclusive nondiscrimination statutes and those without (Table 3).

Table 3: Association between sexual minority identity and binge drinking stratified by presence of inclusive statutes among women in BRFSS, 2015-2018

	States with inclusive statutes				States without inclusive statutes			
	Lesbian vs Straight		Bisexual vs Straight		Lesbian vs Straight		Bisexual vs Straight	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
MODEL 1	1.63	1.30 – 2.05	2.31	2.01 – 2.65	2.53	1.96 – 3.26	2.91	2.50 – 3.40
MODEL 2	1.18	0.92 – 1.52	1.33	1.12 – 1.58	1.71	1.27 – 2.31	1.84	1.56 – 2.19
MODEL 3	1.66	1.32 – 2.08	2.30	2.00 – 2.63	2.54	1.97 – 3.27	2.91	2.49 – 3.39
MODEL 4	1.19	0.92 – 1.53	1.35	1.13 – 1.60	1.71	1.27 – 2.30	1.83	1.55 – 2.17

Model 1: Unadjusted association between sexual identity and binge drinking

Model 2: Model 1 adjusted for age, race, education, income, marital status

Model 3: Model 1 adjusted for pop 21+ years, pop adult male, pop white, percent LGB, median household income, urban pop, catholic rate, region

Model 4: Model 2 adjusted for covariates in Model 3

After controlling for individual demographic characteristics and state-level factors, the odds of binge drinking among lesbian women were 1.71 [95% CI: 1.27–2.30] times higher compared with straight women in states without inclusive statutes. However, in states with inclusive statutes, the odds of binge drinking comparing lesbian and straight women was not significantly different (1.19 [95% CI: 0.92–1.53]). After controlling for individual demographic characteristics and state-level factors, the odds of binge drinking among bisexual women were 1.83 [95% CI: 1.55–2.17] times higher compared to straight women in states without inclusive statutes. However, in states with inclusive statutes, the odds of binge drinking among bisexual women were 1.35 [95% CI: 1.13–1.60] times that of straight women. Thus the odds ratio comparing bisexual to straight women was 26.8% lower in states with vs without inclusive statutes.

There was not a statistically significant interaction between the presence of inclusive statutes and sexual identity for gay men (p=0.3337) and bisexual men (p=0.7881) (data not shown).

Controlling for the presence of nondiscrimination statutes, gay men had 1.25 [95% CI: 1.12–1.40] times the odds and bisexual men had 1.25 [95% CI: 1.09–1.43] times the odds of binge drinking compared with straight men (Table 4).

Table 4: Association between presence of nondiscrimination statutes inclusive of sexual orientation and binge drinking among men in BRFSS, 2015-2018

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	OR [95% CI]	*p*	OR [95% CI]	*p*	OR [95% CI]	*p*	OR [95% CI]	*p*
Inclusive statutes	1.10 [1.06–1.14]	<0.01	1.08 [1.03 – 1.12]	0.01	1.02 [0.96 – 1.08]	0.57	1.00 [0.94 – 1.07]	0.99
Gay	1.25 [1.12–1.40]	0.01	1.02 [0.90 – 1.15]	0.75	1.26 [1.13 – 1.41]	<0.01	1.03 [0.91 – 1.16]	0.64
Bisexual	1.25 [1.09–1.43]	0.01	1.03 [0.88 – 1.21]	0.73	1.25 [1.09 – 1.44]	0.01	1.03 [0.88 – 1.21]	0.70
Straight	Ref		Ref		Ref		Ref	

Model 1: Unadjusted model

Model 2: Model 1 adjusted for age, race-ethnicity, education, income, marital status

Model 3: Model 1 adjusted for pop 21+, pop adult male, pop white, pop LGB, median household income, officers per capita, urban pop, catholic rate, region, survey year

Model 4: Model 2 adjusted for all factors in Model 3

After controlling for individual characteristics and state-level composition factors, there was no association between the presence of nondiscrimination statutes and binge drinking among straight men (1.00 [95% CI: 0.94–1.07]). Moreover, the odds of binge drinking were not significantly different comparing gay and bisexual men to straight men.

DISCUSSION

In this study, we examined the association between the presence of state-level nondiscrimination statutes for employment, housing, and public accommodations that include sexual orientation (i.e., inclusive state statutes) and differences in binge drinking across sex and sexual identity among US adults in 35 states. We found that the presence of inclusive state statutes modifies the association between sexual identity and binge drinking among women, but not among men. The binge drinking disparity between bisexual and straight women was 26.8% lower in states with versus without inclusive statutes. There was no signficant difference in binge drinking between lesbian and straight women in states with inclusive statutes. These findings suggest that the presence of inclusive state statutes may reduce binge drinking disparities among women.

Associations between nondiscrimination law, sexual identity and binge drinking were more complex among women than among men. This complexity may be due to differences in historical gender norms related to excessive alcohol consumption and the ways in which sexual minorities subvert these norms. A recent review of the global literature on drinking patterns finds consistent evidence that straight men are more likely to drink than straight women, have more heavy drinking episodes, and consume more drinks per episode (Hughes, Wilsnack, & Kantor, 2016). It is assumed that women, as a result of their expected responsibilites to be mothers and caretakers, will drink less than men while men may drink more to prove masculine stereotypes (Hughes et al., 2016). The authors suggest that sexual minority women and men subvert these traditional gender norms such that sexual minority women drink more than straight women and sexual minority men do not feel the need to prove masculine sterotypes and thus may drink less than straight men (Hughes et al., 2016). Thus while both sexual minority women and men face minority stress and structural stigma, the ways in which each group subverts these drinking-related gender norms has a different impact on their dirnking patterns and thus disparities when compared with their heterosexual peers. Although nondiscrimination statutes can have a protective effect on binge drinking by buffering LGB populations from structural stigma, multi-level targeted interventions may be needed with a focus on structural, community, and interpersonal levels to fully reduce binge drinking disparities.

These results add to a growing body of literature that examines the factors that underlie differences in harmful alcohol use between sexual minority and heterosexual populations. Previous work has examined the role of social norms and involvement within the LGBT community (Cogger, Conover, & Israel, 2012), the places where individuals drink (Feinstein, Bird, Fairlie, Lee, & Kaysen, 2017; Trocki, Drabble, & Midanik, 2005), and experiences of sexual orientation discrimination (Slater, Godette, Huang, Ruan, & Kerridge, 2017). Not only do our findings fill an important gap by showing that a structural factor (i.e., state policy) is also associated with alcohol-use disparities between sexual minority and straight populations, but also that state-level policy may work differently for based on specific sexual minority status. In states with inclusive statutes, a disparity in alcohol use was found between bisexual and straight women. This may suggest that other social aspects may be a role in these association, such as experiences of bisexual-specific minority stress and less acceptance of bisexual identities in comparison to lesbian and gay identities (Friedman et al., 2014). Policy may not only provide direct protection for sexual minority groups but may also impact other levels of the social ecology including community norms, policies within organizations, interpersonal interactions, and internalized beliefs about homophobia and biphobia. Future research could assist in elucidating these potential connections.

Moreover, sexual minority populations may be comprised of individuals who have other marginalized identities that result in social disadvantage and whose alcohol use may be related to this multiple marginalization. Future research may consider incorporating intersectional theoretical perspectives to examine how different public policies (e.g., nondiscrimination laws that protect on the basis of sexual orientation, gender identity, and race-ethnicity) may influence alcohol use patterns.

Limitations

This study has several limitations. First, most large surveys provide a conservative estimate of binge drinking prevalence in US states. A 2010 study showed that binge drinking prevalence estimates from the 1993-2006 BRFSS accounted for 22-32% of alcohol consumption as measured by alcohol sales data though the two measuers were highly correlated (Nelson, Naimi, Brewer, &

Roeber, 2010). Some of this underestimation was due to the exclusion of populations without landline telephones, many of whom, including college students, are more likely to engage in binge drinking (Nelson et al., 2010). Since 2011, the BRFSS has included both landline and cellphone numbers and improved weighting measures so that the sample is more representative of US residents age 18 years and older (Pierannunzi, Town, Garvin, Shaw, & Balluz, 2012). Nonetheless, underestimation of binge drinking may bias our results towards the null as individuals who engage in binge drinking may be misclassified as non-binge drinkers.

Second, sexual identity is not collected in all 50 US states across the four years of data included in this analysis. We explored compositional differences between states that did and did not use the Sexual Orientation and Gender Identity module in 2015-2018 and did not find significant differences. Moroever, by applying sample weights, we can make inferences from the sample to each state's population. Therefore, our estimates of the differential association between sexual identity and binge drinking by the presence of nondiscrimination statutes are valid for the target populations of the states included.

Third, individuals are classified as binge drinkers based on the sex variable in the BRFSS which was collected using various methods between 2015-2018. Both have limitations with regard to classification of sex and gender minority status. As shown by Riley et al, the use of vocal timbre to determine sex risks misclassifying transgender participants and inflating missing data for sex-specific questions in the BRFSS(Riley, Blosnich, Bear, & Reisner, 2017). As discussed by Bauer and colleagues, single item questions for collecting sex on population surveys may make it difficult participants to determine which dimension of sex or gender is being asked(Bauer, Braimoh, Scheim, & Dharma, 2017). Consequently, transgender and gender non-conforming participants may be misclassified. Therefore, our results are limited in their applicability to gender minority populations regardless of sexual identity.

Finally, the BRFSS may undercount sexual minority populations, particularly in states without inclusive statutes. A 2017 study found that approximately 30% of gay and bisexual men in a community sample would not reveal their sexual identity, if asked, on a government survey (Ferlatte, Hottes, Trussler, & Marchand, 2017). Intent not to disclose was particularly high for bisexual men and sexual minority men with female partners (Ferlatte et al., 2017). Although BRFSS does not collect personally identifiable information, the intent to not dislose sexual identity means that individuals might be misclassified or simply refuse to answer questions about sexual identity. This misclassification might mean that the true difference in binge drinking prevalence between sexual minorities and heterosexual populations, particularly among bisexual men, are actually wider than our estimates.

CONCLUSIONS

Despite these limitations, we found that the binge drinking disparity between lesbian and bisexual women and straight women was narrower in states with inclusive nondiscrimination statutes. Enacting nondiscrimination statutes that are inclusive of sexual orientation at the state-level can narrow the disparity in binge drinking between sexual minority women and heterosexual women. Alcohol policy environments have been shown to reduce binge drinking in the general population (Xuan et al., 2015). Future research examining binge drinking disparities among lesbian, gay, and bisexual adults should consider incorporating measures of the alcohol policy environment or individual alcohol polices to see if there is a synergistic relationship between

nondiscrimination laws and alcohol policies and seek to better understand the pathways and mechanisms underlying these associations. It is possible that these two structural factors may work in tandem.

While our study focused on state-level binge drinking disparities and nondiscrimination laws, it is critical to acknowledge that individual alcohol consumption can be impacted by policy at various political levels. Sub-state entities, such as citites, may also pass nondiscrimination ordinances that include sexual orientation. Therefore, even in a state without state-level statutes, people living in these municipalities may still have legal protections on the basis of sexual orientation, though they are often more limited (Mallory, Sears, Mallory, & Sears, 2020). For example, Kansas does not have state-level nondiscrimination protections inclusive of sexual orientation; however, 16 citites covering approximately 33% of the LGBT population in Kansas do have local ordinances (Movement Advancement Project, 2020). Future research may consider estimating the sub-state prevalence of binge drinking to understand how local protective policies are associated with excessive alcohol use and how effective they are in reducing binge drinking disparities when state-level protections do not exist. Moreoever, examining the difficulty of passing state-level nondiscrimination statutes and the duration that states have had statutes may be an additional indicator of structural stigma that future studies may examine. It will be important to separate the effects of the presence of the law from duration that the law has been present.

Finally, our study took a resiliency approach by examining whether nondiscrimination statutes can be protective. However, many states not only lack basic protections for LGBT people, but also enact laws that allow religious organizations the right to deny services to sexual and gender minorities on the basis of religious beliefs. The lack of legal protections and the institutionalization of discrimination may work synergistically to produce wider health disparities among LGBT populations in these states. Understanding these mechanisms can drive advocacy efforts to create more equitable environments for LGBT people.

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Appendix A: Supplementary Tables

Supplemental Table A.1: Prevalence of binge drinking and presence of inclusive nondiscrimination statutes among women in states using the SOGI module, BRFSS, 2015-2018

State	All Women	Straight	Lesbian	Bisexual	Inclusive Nondiscrimination Statutes	Diff Lesbian vs Straight[1]	Diff Bisexual v Straight[2]	Diff Bisexual v Lesbian[3]	Ratio Lesbian v Straight[4]	Ratio Bisexual v Straight[5]	Ratio Bisexual v Lesbian[6]
All States	**11.4**	**10.9**	**20.1**	**24.1**	**NA**	**9.2**	**13.2**	**4.0**	**1.8**	**2.2**	**1.2**
California	11.8	10.9	16.1	19.4	Yes	5.2	8.5	3.3	1.5	1.8	1.2
Colorado	12.4	11.6	30.4	23.9	Yes	18.8	12.3	-6.5	2.6	2.1	0.8
Connecticut	12.0	11.2	20.8	28.2	Yes	9.6	17.0	7.4	1.9	2.5	1.4
Delaware	12.5	12.0	15.7	22.8	Yes	3.7	10.8	7.1	1.3	1.9	1.5
Florida	10.4	10.0	22.5	24.0	No	12.5	14.0	1.5	2.3	2.4	1.1
Georgia	9.6	8.8	15.1	11.4	No	6.3	2.6	-3.7	1.7	1.3	0.8
Hawaii	12.6	11.8	30.4	29.6	Yes	18.6	17.8	-0.8	2.6	2.5	1.0
Idaho	10.4	9.3	15.3	19.9	No	6.0	10.6	4.6	1.6	2.1	1.3
Illinois	14.0	13.2	16.3	24.2	Yes	3.1	11.0	7.9	1.2	1.8	1.5
Indiana	11.0	10.4	15.7	16.3	No	5.3	5.9	0.6	1.5	1.6	1.0
Iowa	15.1	14.6	27.7	33.9	Yes	13.1	19.3	6.2	1.9	2.3	1.2
Kansas	10.4	9.6	25.3	24.3	No	15.7	14.7	-1.0	2.6	2.5	1.0
Kentucky	9.2	8.4	32.4	18.4	No	24.0	10.0	-14.0	3.9	2.2	0.6
Louisiana	12.5	10.9	26.8	24.2	No	15.9	13.3	-2.6	2.5	2.2	0.9
Maryland	11.0	9.9	26.4	18.1	Yes	16.5	8.2	-8.3	2.7	1.8	0.7
Massachusetts	14.1	12.8	8.4	31.3	Yes	-4.4	18.5	22.9	0.7	2.4	3.7
Minnesota	15.0	14.7	22.0	24.5	Yes	7.3	9.8	2.5	1.5	1.7	1.1
Mississippi	7.3	6.8	25.6	15.2	No	18.8	8.4	-10.4	3.8	2.2	0.6
Missouri	13.1	11.3	12.4	39.1	No	1.1	27.8	25.7	1.2	3.5	2.9
Montana	13.3	12.8	24.2	28.1	No	11.4	15.3	3.9	1.9	2.2	1.2
Nevada	10.4	9.5	19.2	22.9	Yes	9.7	13.4	3.8	2.0	2.4	1.2
New York	12.6	11.8	17.8	23.5	Yes	6.0	11.7	5.7	1.5	2.0	1.3
North Carolina	10.2	9.0	9.5	18.0	No	0.5	9.0	8.5	1.1	2.0	1.9

Ohio	12.3	11.4	16.4	25.7	No	5.0	14.3	9.3	1.4	2.3	1.6
Oklahoma	8.7	7.4	33.7	17.6	No	26.3	10.2	-16.1	4.6	2.4	0.5
Pennsylvania	12.8	11.6	18.1	25.5	No	6.5	13.9	7.4	1.6	2.2	1.4
Rhode Island	12.1	11.3	20.6	20.4	Yes	9.3	9.1	-0.2	1.8	1.8	1.0
South Carolina	9.9	9.0	29.6	16.3	No	20.6	7.3	-13.3	3.3	1.8	0.6
Tennessee	9.9	8.2	25.1	37.0	No	16.9	28.8	11.9	3.1	4.5	1.5
Texas	11.7	10.9	31.5	28.9	No	20.6	18.0	-2.6	2.9	2.7	0.9
Vermont	13.2	12.6	10.3	23.7	Yes	-2.3	11.1	13.4	0.8	1.9	2.3
Virginia	11.9	10.5	25.6	27.1	No	15.1	16.6	1.5	2.4	2.6	1.1
Washington	11.7	10.9	17.7	26.8	Yes	6.8	15.9	9.1	1.6	2.5	1.5
West Virginia	5.4	5.0	14.8	19.3	No	9.8	14.3	4.5	3.0	3.9	1.3
Wisconsin	18.0	17.2	21.7	25.5	Yes	4.5	8.3	3.8	1.3	1.5	1.2

[1] Difference in binge drinking prevalence between lesbian and straight women
[2] Difference in binge drinking prevalence between bisexual and straight women
[3] Difference in binge drinking prevalence between bisexual and lesbian women
[4] Ratio of the prevalence in binge drinking comparing lesbian to straight women
[5] Ratio of the prevalence in binge drinking comparing bisexual to straight women
[6] Ratio of the prevalence in binge drinking comparing bisexual to lesbian women

Supplemental Table A.2: Prevalence of binge drinking and presence of inclusive nondiscrimination statutes among men in states using the SOGI module, BRFSS, 2015-2018

State	All Men	Straight	Gay	Bisexual	Inclusive Nondiscrimination Statutes	Diff Gay[1]	Diff Bisexual[2]	Diff Bisexual vs Gay[3]	Ratio Gay[4]	Ratio Bisexual[5]	Ratio Bisexual v Gay[6]
All States	**21.6**	**21.4**	**25.5**	**25.4**	**NA**	**4.1**	**4.0**	**-0.1**	**1.2**	**1.2**	**1.0**
California	18.4	21.8	28.4	28.6	Yes	6.6	6.8	0.2	1.2	0.4	1.0
Colorado	21.1	21.4	38.4	25.2	Yes	17.0	3.8	-13.2	1.1	0.9	0.7
Connecticut	19.0	20.9	19.5	32.7	Yes	-1.4	11.8	13.2	0.9	0.9	1.7
Delaware	21.2	19.4	18.4	23.5	Yes	-1.0	4.1	5.1	1.4	1.0	1.3
Florida	22.1	20.2	17.2	20.7	No	-3.0	0.5	3.5	1.4	1.0	1.2
Georgia	23.3	17.1	23.7	20.3	No	6.6	3.2	-3.4	1.5	1.0	0.9
Hawaii	20.9	25.3	23.4	31.2	Yes	-1.9	5.9	7.8	0.9	1.0	1.3
Idaho	26.3	19.4	27.0	34.1	No	7.6	14.7	7.1	1.1	1.0	1.3
Illinois	19.5	25.9	28.3	26.6	Yes	2.4	0.7	-1.7	1.0	1.1	0.9
Indiana	20.2	21.9	21.8	33.7	No	-0.1	11.8	11.9	1.1	1.1	1.5
Iowa	20.5	27.6	29.4	29.9	Yes	1.8	2.3	0.5	0.8	1.1	1.0
Kansas	27.3	20.6	28.1	20.8	No	7.5	0.2	-7.3	1.1	1.1	0.7
Kentucky	17.6	20.1	16.8	22.4	No	-3.3	2.3	5.6	2.7	1.1	1.3
Louisiana	20.4	22.1	11.4	25.2	No	-10.7	3.1	13.8	1.7	1.1	2.2
Maryland	22.6	16.3	20.1	25.7	Yes	3.8	9.4	5.6	0.5	1.1	1.3
Massachusetts	29.2	21.4	22.7	25.4	Yes	1.3	4.0	2.7	1.3	1.1	1.1
Minnesota	18.5	25.6	29.2	29.7	Yes	3.6	4.1	0.5	1.4	1.2	1.0
Mississippi	23.0	18.7	23.3	8.1	No	4.6	-10.6	-15.2	1.8	1.2	0.3
Missouri	22.6	21.6	26.6	29.3	No	5.0	7.7	2.7	1.1	1.2	1.1
Montana	25.7	23.7	21.4	36.7	No	-2.3	13.0	15.3	1.1	1.2	1.7
Nevada	19.4	21.2	22.6	18.4	Yes	1.4	-2.8	-4.2	0.9	1.2	0.8
New York	23.1	21.1	28.5	21.5	Yes	7.4	0.4	-7.0	1.0	1.2	0.8
North Carolina	21.9	19.1	32.8	21.9	No	13.7	2.8	-10.9	1.2	1.3	0.7
Ohio	25.5	23.0	28.7	34.1	No	5.7	11.1	5.4	0.9	1.2	1.2

Oklahoma	22.3	17.1	17.6	25.7	No	0.5	8.6	8.1	1.3	1.3	1.5
Pennsylvania	22.3	22.9	35.2	23.3	No	12.3	0.4	-11.9	1.2	1.4	0.7
Rhode Island	21.2	21.4	12.2	33.6	Yes	-9.2	12.2	21.4	1.2	1.4	2.8
South Carolina	17.9	20.1	24.8	28.6	No	4.7	8.5	3.8	1.0	1.5	1.2
Tennessee	17.1	17.9	15.5	15.8	No	-2.4	-2.1	0.3	1.2	1.6	1.0
Texas	23.6	22.3	22.8	27.1	No	0.5	4.8	4.3	1.2	1.5	1.2
Vermont	21.5	20.9	26.0	26.4	Yes	5.1	5.5	0.4	0.9	1.6	1.0
Virginia	22.5	19.7	21.6	21.8	No	1.9	2.1	0.2	1.0	1.5	1.0
Washington	21.9	18.7	19.1	19.9	Yes	0.4	1.2	0.8	0.6	1.6	1.0
West Virginia	24.1	16.7	44.3	19.0	No	27.6	2.3	-25.3	0.9	1.5	0.4
Wisconsin	19.8	29.2	37.2	32.3	Yes	8.0	3.1	-4.9	1.4	1.8	0.9

[1] Difference in binge drinking prevalence between gay and straight men
[2] Difference in binge drinking prevalence between bisexual and straight men
[3] Difference in binge drinking prevalence between bisexual and gay men
[4] Ratio of the prevalence in binge drinking comparing gay to straight men
[5] Ratio of the prevalence in binge drinking comparing bisexual to straight men
[6] Ratio of the prevalence in binge drinking comparing bisexual to gay men