



Health Disparities Among Sexual Minority Adults in Indiana: Findings from the 2014-2017 and 2020 Behavioral Risk Factor Surveillance System



Indiana
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HEALTH DISPARITIES AMONG SEXUAL MINORITY ADULTS IN INDIANA: FINDINGS FROM THE 2014-2017 AND 2020 BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM

Report Prepared By:

Madeline Powers, *BRFSS Data Analyst*

Acknowledgements:

Courtney Lambert, *Data Analysis Team Director*

Kristy Thacker, *Indiana State BRFSS Coordinator*

ABSTRACT

Previous research has demonstrated that sexual minorities have a higher prevalence of health risk behaviors and poor health outcomes compared to their heterosexual counterparts, indicating how health disparities for lesbian, gay, bisexual and other sexual minorities (LGB+) are of increasing importance to explore. The primary objective of this study was to examine the associations between sexual orientation and depression diagnoses, cigarette smoking and binge drinking in Indiana. A secondary analysis of pooled 2014-2017 and 2020 Indiana Behavioral Risk Factor Surveillance System (BRFSS) survey data (N=43,918) was conducted. SAS survey procedures were utilized to calculate weighted descriptive statistics for LGB+ people. Rao-Scott chi-square test statistics were used to identify significant differences between demographic groups. Multivariate logistic regression models stratified by sex also were developed to assess the relationships between sexual orientation and the selected health outcomes/behaviors, when adjusting for race/ethnicity, age and education.

LGB+ men all had greater odds of reporting a depression diagnosis in their lifetime compared to men who identified as heterosexual (aOR 3.03, $p<0.0001$; aOR 4.06, $p<0.0001$; aOR 3.62, $p<0.0001$). These findings were similar for women, with women who identified as lesbian, bisexual, or another non-heterosexual identity having greater odds of reporting a depression diagnosis in their lifetime (aOR 2.55, $p<0.0001$; aOR 3.61, $p<0.0001$; aOR 3.38, $p<0.0001$). For cigarette smoking, men who identified as gay had greater odds of being current smokers compared to heterosexual men (aOR 2.54, $p<0.0001$) and women who identified as bisexual or lesbian both had greater odds of being current smokers compared to heterosexual women (aOR 1.77, $p<0.01$; aOR 1.65, $p<0.05$). Sexual minorities did not experience higher odds of binge drinking. Findings from this study are consistent with previous research that health disparities exist for sexual minorities. Policymakers, healthcare providers and public health practitioners in Indiana can use this research to improve policies and health interventions within the state.

INTRODUCTION

Health disparities experienced by lesbian, gay, bisexual and other sexual minority (LGB+) people are of increasing importance to study in order to develop effective interventions and policy changes to improve health outcomes among members of these populations. However, lack of substantial data, especially at the state or county level, makes it difficult to address and identify health disparities that sexual minorities experience. Several objectives within the *Healthy People 2030* goals focus on eliminating health disparities within the LGB+ population, as well as increasing the number of national surveys that collect data on sexual orientation and gender identity.¹

A growing number of health behavior surveys have added sexual orientation questions in recent years, which broadens the potential for research on these populations. Population-based studies that include questions about sexual orientation allow for in-depth analyses on LGB+ health disparities. The Centers for Disease Control and Prevention (CDC) began to include a module about sexual orientation and gender identity (SOGI) in the National Health Interview Survey (NHIS) starting in 2013.² In 2014, the Behavioral Risk Factor Surveillance System (BRFSS) started offering an optional SOGI module for states to include, further allowing researchers to gain important insight into the health-related issues faced by members of the LGB+ population.

LITERATURE REVIEW

Previous studies using sexual orientation data have found that sexual minorities have a higher prevalence of health risk behaviors and poor health outcomes compared to their heterosexual counterparts.³ Numerous studies using data from sexual minority groups have found that sexual minority members are more likely to report frequent feelings of depression^{4,5} and have higher odds of ever being diagnosed with depression.^{5,6} Findings from a meta-analysis of national and regional studies on sexuality and mental health further supported these findings that sexual minority members in the United States are more likely to experience poor mental health outcomes, such as depression diagnosis.⁷

Past studies have also found that sexual minorities are more likely to engage in health risk behaviors like cigarette smoking. Gonzales & Henning-Smith (2017) found that lesbian, gay and bisexual women and men were all more likely to be current smokers compared to their heterosexual counterparts.⁶ Matthews & Lee (2014) found that in North Carolina, sexual minority women were more likely to report current smoking behaviors compared to heterosexual women; however, there were no significant differences in smoking behaviors between sexual minority men and heterosexual men.⁸

Results from previous studies that examined the link between sexual orientation and binge drinking behaviors have been inconsistent. A study combining 2014 and 2015 BRFSS data from 27 U.S. states found that bisexual and lesbian women were more likely to binge drink compared to heterosexual women; however, there were no significant differences in reported binge drinking between heterosexual

men and men who reported belonging to a sexual minority group.⁶ Meanwhile, among North Carolina residents, there was no significant association between being a member of a sexual minority group and binge drinking.⁸

STUDY OBJECTIVE

This study explored the associations between sexual orientation and certain health outcomes and health-risk behaviors (depression diagnosis, smoking and binge drinking) among Indiana adults using data from the Indiana BRFSS. These three outcome variables were specifically chosen because previous studies have identified that disparities exist between the LGB+ population and their heterosexual counterparts for depression diagnosis, smoking and binge drinking. The analyses sought to identify whether sexual minority men and women in Indiana are at a higher risk of binge drinking, current smoking and having ever been diagnosed with a depressive disorder compared to their heterosexual counterparts. Results were compared to previous literature to examine how data from Indiana compares to other states. This is the first known study to explore the relationship between sexual orientation and depression diagnosis, smoking and binge drinking utilizing Indiana's BRFSS data.

METHODS

DATA SOURCE

The Behavioral Risk Factor Surveillance System (BRFSS) is a cross-sectional, state-based telephone survey that was established by the Centers for Disease Control and Prevention (CDC) in 1984, and it is the largest continuously conducted health surveillance system in the world. Indiana is one of the 15 states that has been using the BRFSS since its inception as a principal source of data for health risk behaviors, chronic health conditions, health care access and preventative health practices. Data from the BRFSS is used to set objectives, track progression and evaluate the effectiveness of health-related initiatives at state and local levels, with the goal of preventing and managing chronic conditions. Starting in 2014, the BRFSS offered states an optional and unified sexual orientation and gender identity (SOGI) module, which Indiana chose to include in its 2014-2017 and 2020 surveys. Data from these five years (2014, 2015, 2016, 2017 and 2020) of the Indiana BRFSS were analyzed for this study.

The BRFSS selects adults using random digit dialing (RDD). It uses a multistage sampling design to select a representative sample of noninstitutionalized adult population that is aged ≥ 18 years residing within each state and territory in the United States. Data are cleaned and weighted by the CDC before use. The BRFSS accounts for unequal selection probabilities, noncoverage and nonresponse through designed weighting and raking. The designed weights reduce the value of extremely high weights and increase the value of extremely low weights, with the objective of providing more accurate prevalence estimates. Raking, or iterative proportional fitting, makes the sociodemographic makeup of the BRFSS more closely resemble the known sociodemographic makeup of the states.

MEASURES

Data from several sociodemographic characteristics were obtained from the survey, including age, sex, race and education, and classification of these variables was based on categories commonly used in other BRFSS publications.⁹⁻¹¹ Age was divided into five age ranges to exemplify different stages of life (18-24, 25-34, 35-44, 45-54 and 65+). Sex was dichotomized into male or female. Respondents were also categorized by race/ethnicity, which resulted in the groups of White, Black and Hispanic. Respondents belonging to any other racial/ethnic groups or multiple races, were categorized as Other/Multiple Races due to small sample size. Education was divided into four levels of educational attainment: did not graduate high school, graduated high school, attended college and graduated college.

Sexual orientation was measured by the following item from the SOGI module: "Which of the following best represents how you think of yourself: 1) lesbian or gay, 2) straight, that is, not gay, 3) bisexual, 4) something else?". This wording has varied slightly over the years, but the question has still measured sexual orientation in a consistent manner. Those who responded with "something else" to the sexual orientation question are categorized as "other", and they are included as representing a sexual minority. Throughout this report, individuals who identified as sexual minorities (lesbian or gay, bisexual, or other) are categorized as being LGB+. Although the SOGI module also collects information on gender identity, this study chose to focus only on differences in health outcomes based on sexual orientation.

Depressive disorder, measured dichotomously, was assigned to individuals who reported having ever been diagnosed by a doctor, nurse, or other health professional with depression, major depression, dysthymia, or minor depression. For the health risk behaviors of binge drinking and current smoking, responses were dichotomized as "yes" or "no". Binge drinking was assigned to males who had five or more drinks or females who had four or more drinks on one or more occasions in the past 30 days. Current smoking was defined as having smoked at least 100 cigarettes in their lifetime and currently smoking cigarettes some days or every day.

STATISTICAL ANALYSIS

All analyses were performed using SAS version 9.4 and weighted using the weighting and stratification variables from the 2014, 2015, 2016, 2017 and 2020 Indiana BRFSS datasets. Five years of data were pooled to obtain an adequate sample size to analyze. CDC guidance for combining multiple years of data was used, as the weighting variable for each year had to be adjusted proportionally for the combined dataset.¹² All analyses were stratified by sex because sex is an important predictor of depression diagnosis, smoking habits and binge drinking, with women's depression rates exceeding those of men¹³ and men's cigarette smoking rates¹⁴ and binge drinking¹⁵ rates being consistently higher than women's. Only weighted percentages were included in the results. Responses for any questions where participants said "Don't know/Not sure" or refused to answer were recoded as missing. All missing data for the sexual orientation and sex variables (N=6,263) were excluded from further analysis, resulting in a sample size of 43,918 respondents. Any prevalence estimates with a denominator of less

than 50 or coefficient of variation greater than 0.3 were suppressed. Statistical analyses were conducted at 95% confidence intervals (CIs).

Weighted descriptive statistics were calculated to describe the demographic characteristics for the sexual orientation categories by sex, race/ethnicity, age and education. Rao-Scott chi square analyses were used to identify significant differences between demographic groups and sexual orientation. Only sociodemographic variables with statistically significant results from the chi-square analyses (p values less than or equal to 0.05) were included as covariates. Multivariate logistic regression models stratified by sex were conducted to assess the relationship between sexual orientation and depression diagnosis, smoking and binge drinking, when adjusting for age, race/ethnicity and educational attainment. Results from the logistic regression models are presented as adjusted odds ratios (aORs) with 95% CIs. Adjusted odds ratios were determined to be significant if the corresponding 95 percent CIs did not overlap with 1.00.

RESULTS

Table 1: Prevalence of Demographics Characteristics by Sexual Orientation and Sex

	Heterosexual		Gay or Lesbian		Bisexual		Other	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Men								
Age								
18-24	13.43	12.60 - 14.27	22.46	15.85 - 29.07	35.49	26.93 - 44.05	Not Reportable	
25-34	16.20	15.36 - 17.04	21.66	15.20 - 28.13	18.68	12.34 - 25.03	Not Reportable	
35-44	16.38	15.61 - 17.15	16.62	10.97 - 22.26	10.48	5.81 - 15.15	Not Reportable	
45-54	17.14	16.44 - 17.83	16.96	12.04 - 21.88	12.01	7.15 - 16.87	Not Reportable	
55-64	17.79	17.16 - 18.41	11.58	8.24 - 14.93	12.14	8.23 - 16.06	13.87	6.33 - 21.41
65+	19.06	18.47 - 19.65	10.72	7.52 - 13.91	11.19	7.87 - 14.51	39.28	26.82 - 51.75
Race/Ethnicity								
White [‡]	83.52	82.72 - 84.32	84.15	78.24 - 90.06	83.89	77.85 - 89.93	67.18	54.53 - 79.83
Black [‡]	7.95	7.34 - 8.56	9.88	5.00 - 14.77	Not reportable		Not reportable	
Hispanic	4.51	3.61 - 4.43	Not reportable		Not reportable		Not reportable	
Other/Multiracial [‡]	4.02	4.06 - 4.96	Not reportable		6.59	2.79 - 10.40	Not reportable	
Education								
Did not graduate HS	12.53	11.73 - 13.32	9.60	4.21 - 14.98	12.75	6.29 - 19.2	30.99	18.12 - 43.85
Graduated HS	35.87	34.93 - 36.81	29.00	22.55 - 35.46	38.88	30.95 - 46.81	39.28	26.65 - 51.91
Some college [§]	29.36	28.45 - 30.27	35.23	28.12 - 42.34	30.59	22.93 - 38.24	Not reportable	

Graduated college [§]	22.24	21.57 - 22.92	26.17	20.85 - 31.49	17.78	13.11 - 22.44	16.10	7.96 - 24.23
Women								
Age								
18-24	10.70	9.90 - 11.50	32.14	22.17 - 42.10	49.31	43.15 - 55.47	32.22	17.64 - 46.80
25-34	15.06	14.31 - 15.80	13.88	7.88 - 19.88	25.94	20.94 - 30.94	16.93	7.71 - 26.15
35-44	15.84	15.16 - 16.51	15.16	9.64 - 20.67	11.36	8.12 - 14.60	Not Reportable	
45-54	16.58	15.98 - 17.17	18.40	12.23 - 24.57	5.17	3.33 - 7.01	11.09	5.22 - 16.96
55-64	18.11	17.55 - 18.67	13.04	8.63 - 17.44	4.82	3.10 - 6.55	12.40	6.19 - 18.61
65+	23.72	23.14 - 24.30	7.39	4.26 - 10.52	3.40	2.29 - 4.51	18.20	11.65 - 24.76
Race/Ethnicity								
White [‡]	84.14	83.44 - 84.84	78.84	70.82 - 86.86	77.61	72.37 - 82.85	71.57	60.05 - 83.09
Black [‡]	8.49	7.95 - 9.04	12.87	5.66 - 20.08	10.29	6.02 - 14.55	Not reportable	
Hispanic	4.81	4.37 - 5.25	Not reportable		6.72	3.58 - 9.86	18.23	7.86 - 28.61
Other/Multiracial [‡]	2.55	2.27 - 2.84	Not reportable		5.39	3.30 - 7.48	Not reportable	
Education								
Did not graduate HS	11.25	10.59 - 11.91	Not reportable		17.54	11.82 - 23.25	17.14	7.08 - 27.20
Graduated HS	33.06	32.24 - 33.88	33.74	25.43 - 42.05	33.97	28.20 - 39.75	37.26	25.04 - 49.49
Some college [§]	32.89	32.03 - 33.74	39.48	30.17 - 48.80	36.79	30.99 - 42.59	30.01	17.47 - 42.54
Graduated college [§]	22.81	22.17 - 23.44	20.87	15.09 - 26.64	11.70	9.01 - 14.39	15.59	8.72 - 22.45
Percentages may not add up to 100% due to missing responses. Responses that were listed as "Don't Know/Not Sure" or "Refused" were classified as missing values in the analysis.								
§ Includes technical school								
‡ Non-Hispanic								

Table 1 presents the demographic characteristics of the study sample of Indiana adults using 2014-2017 and 2020 BRFSS data, separated by sexual orientation and stratified by sex. Approximately 4.55% of Indiana adults in the weighted sample identified as lesbian, gay, bisexual, or other (LGB+). Weighted analyses showed that 94.77% of women reported being heterosexual, 1.17% lesbian, 3.52% bisexual and 0.54% another non-heterosexual identity. Among men, 96.16% reported being heterosexual, 1.89% gay, 1.58% bisexual and 0.37% another non-heterosexual identity. Compared to heterosexual adults (those who said they were straight in the survey), individuals who identified as LGB+ tended to be younger, be more racially and ethnically diverse and have lower educational attainment.

Table 2: Prevalence of Health Outcomes by Sexual Orientation and Sex

	Heterosexual		Gay or Lesbian		Bisexual		Other	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Men								
Depression diagnosis	14.35	13.66 - 15.04	33.36	26.39 - 40.32	42.09	34.01 - 50.17	37.51	24.16 - 50.86
Smoking	23.07	22.19 - 23.95	37.50	30.25 - 44.75	25.26	18.31 - 32.22	22.11	11.24 - 32.99
Binge drinking	21.29	20.43 - 22.15	25.03	18.37 - 31.68	28.48	20.50 - 36.45	Not reportable	
Women								

Depression diagnosis	25.57	24.80 - 26.35	45.40	36.31 - 54.49	56.58	50.53 - 62.63	49.99	37.24 - 62.73
Smoking	19.44	18.70 - 20.18	28.33	20.47 - 36.19	33.89	28.03 - 39.76	Not reportable	
Binge drinking	10.38	9.77 - 10.98	13.12	6.80 - 19.43	19.45	14.63 - 24.27	Not reportable	

Table 2 shows the prevalence of health outcomes and behaviors of interest among those in the study sample, separated by sexual orientation and stratified by sex. When looking at depression diagnosis, over half of women identifying as bisexual (56.58%) and nearly half of women identifying as lesbian (45.40%) or another non-heterosexual identity (49.99%) had ever been diagnosed with depression, which were all significantly higher prevalences compared to heterosexual women (25.57%). Similar trends were present for men, with men identifying as bisexual, another non-heterosexual identity, or gay all having significantly higher prevalences of depression diagnoses (42.09%, 37.51% and 33.36%, respectively) compared to heterosexual men (14.35%). For current cigarette smoking, bisexual women and lesbian women had significantly higher prevalences of smoking (33.89% and 28.33%, respectively) compared to their heterosexual counterparts (19.44%). For men, gay men had a significantly higher prevalence of smoking (37.50%) compared to heterosexual men (23.07%). Lastly, with regards to binge drinking, nearly one-fifth of bisexual women (19.45%) reported binge drinking in the past month, which is a significantly higher prevalence compared to heterosexual women (10.38%). There were no significant differences in reported binge drinking behaviors between heterosexual men and sexual minority men.

Table 3: Unadjusted Bivariate Associations			
Bivariate Associations	χ^2	DF	Pr < χ^2
Depression Diagnosis			
Sexual orientation	374.88	3	<0.0001
Age	172.88	5	<0.0001
Race/Ethnicity	75.11	3	<0.0001
Education	167.94	3	<0.0001
Smoking Status			
Sexual orientation	51.76	3	<0.0001
Age	472.15	5	<0.0001
Race/Ethnicity	41.15	3	<0.0001
Education	1255.38	3	<0.0001
Binge Drinking			
Sexual orientation	16.79	3	0.0008
Age	1015.34	5	<0.0001
Race/Ethnicity	13.08	3	0.0045
Education	22.66	3	<0.0001

Table 3 presents the unadjusted bivariate associations for the predictor (sexual orientation) and covariates (age, race/ethnicity and education) for the outcomes of depression diagnosis, cigarette smoking and binge drinking. The chi-square analyses demonstrated that sexual orientation, age, race/ethnicity and education were all statistically significantly associated with depression diagnosis and current smoking status, with p values of less than 0.0001 for each variable. For binge drinking, the variables were also statistically significant, with p values less than 0.05 for each variable.

Table 4: Adjusted Odds Ratios for Health Outcomes by Sexual Orientation						
	Gay or Lesbian		Bisexual		Other	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Men						
Depression diagnosis	3.03***	2.19 - 4.18	4.06***	2.83 - 5.81	3.62***	2.00 - 6.56
Smoking	2.54***	1.83 - 3.51	1.08	0.70 - 1.65	0.89	0.46 - 1.71
Binge drinking	1.10	0.76 - 1.59	1.29	0.86 - 1.94	0.67	0.29 - 1.56
Women						
Depression diagnosis	2.55***	1.72 - 3.77	3.61***	2.77 - 4.72	3.38***	2.00 - 5.73
Smoking	1.65	1.05 - 2.59	1.77**	1.31 - 2.39	1.00	0.42 - 2.35
Binge drinking	0.96	0.53 - 1.74	1.28	0.93 - 1.78	1.63	0.76 - 3.51

* p<0.05, ** p<0.01, ***p<0.0001
aOR: Adjusted Odds Ratio
Odds ratios were adjusted for age, race and education, with respondents identifying as heterosexual as the referent.

Table 4 presents the logistic regression results showing the relationship between sexual orientation and the three outcomes of interest for both female and male respondents, when adjusting for age, race/ethnicity and education. Results from the logistic regression model using female respondents found that bisexual women (aOR=3.61), lesbian women (aOR=2.55) and women identifying as another non-heterosexual identity (aOR=3.38) all had greater odds of having been diagnosed with depression compared to heterosexual women. When comparing current smoking habits of sexual minority women to those of heterosexual women, bisexual women had 1.77 times greater odds of being current smokers, and lesbian women had 1.65 times greater odds of being current smokers. For binge drinking, no significant differences were found when comparing sexual minority women to heterosexual women.

Many similar results were found when analyzing data from male respondents. When adjusting for race/ethnicity, education and age, bisexual men (aOR=4.06), gay men (aOR=3.03) and men identifying as another non-heterosexual identity (aOR=3.62) all had greater odds of ever having been diagnosed with depression compared to heterosexual men. Gay men also had 2.54 times greater odds of being current smokers compared to heterosexual men. There were no significant differences in current smoking behaviors for bisexual men and men identifying as another non-heterosexual identity, when compared to heterosexual men. Lastly, for binge drinking, there were no significant differences between sexual minority males and heterosexual males.

DISCUSSION

To our knowledge, this is the first study to use BRFSS data to examine the associations between sexual orientation and lifetime depression diagnosis, smoking and binge drinking among Indiana adults. Through analyzing five years of pooled Indiana BRFSS data from 2014-2017 and 2020, there is evidence that adults in Indiana who are sexual minorities have an increased risk of engaging in health-related risk behaviors, as well as suffering from poor mental health outcomes. Stratifying the analyses by sex allowed for a better understanding of the relationship between sex and health outcomes and risk behaviors.

Sexual minorities in Indiana have both a higher prevalence and greater odds of having ever been diagnosed with depression compared to heterosexual adults. In particular, bisexual women and men have the greatest odds of depression diagnosis compared to other sexual minority groups, which is similar to findings from past studies analyzing data from multiple states.^{5,6} The consistency in poor mental health outcomes for sexual minorities across the United States indicates the need for improved access to mental health care for sexual minorities.

Smoking behaviors varied between sexual minorities in Indiana, with gay men (but not bisexual men) having higher odds of being current smokers compared to heterosexual men, and lesbian and bisexual women having higher odds of being current smokers compared to heterosexual women. These findings differed slightly from past research, which found that gay, lesbian and bisexual respondents (of both sexes) were all significantly more likely to currently smoke cigarettes when compared to their heterosexual counterparts.^{6,16} It is possible that the disparities in smoking rates between sexual minority adults in Indiana compared to heterosexual adults can be attributed to added stressors associated with sexual orientation, the social environment for sexual minorities and targeted marketing campaigns^{17,18} Previous studies have found that sexual minorities sometimes frequent bars and clubs more often than heterosexual adults, which are locations where smoking is more common.¹⁷ In addition, the tobacco industry has more aggressively marketed their products towards the LGB+ community through advertising, event sponsorships, social media and outreach efforts,¹⁸ whereas anti-tobacco messaging is less likely to reach this population.¹⁹

Concerning binge drinking behaviors, bisexual women had a significantly higher prevalence of binge drinking compared to heterosexual women; however, the logistic regression model indicated that there were not any significant differences between groups based on sexual orientation for both women and men. This is consistent with findings from a study focused on North Carolina residents,⁸ but different from findings from other studies, which found that lesbian and bisexual women were more likely to be recent binge drinkers.^{5,6} Since sexual minorities may be more likely to have higher rates of risk factors for drinking problems, including experiencing discrimination and stress, this could be a reason some studies found a relationship between sexual orientation and binge drinking.³

Most of our findings using a sample of Indiana adults are consistent with previous research that suggests minority stress (associated with being a member of a marginalized minority population) may be associated with increased health risk behaviors as well as poor mental health outcomes among sexual minority populations.⁶ At the structural level, social exclusion, social stigma and institutional heterosexuality may all contribute to participation in health risk behaviors among sexual minorities.⁵ Feelings of shame, rejection and low self-esteem can result from discrimination towards the LGB+ population, in turn negatively shaping mental health outcomes and shaping health risk behaviors.²⁰ Indiana state policies related to sexual orientation have the potential to create a discriminatory environment, which can stigmatize sexual minorities, reduce self-esteem and lead to adverse health outcomes. According to a *Human Rights Campaign* report, Indiana is one of more than 20 states that fall under the “high priority to achieve basic equality” category, as there are currently no existing non-discrimination protections in employment, housing and public accommodations for members of the LGB+ community in our state.²¹ This means that public policy changes in Indiana to protect LGB+ people from discrimination and foster inclusion are needed to help eliminate the root causes of these health disparities.

LIMITATIONS

The findings from this study are subject to several limitations. First, due to the cross-sectional design of the BRFSS, it cannot be determined whether any observed relationships are causal. In addition, the use of self-report data is subject to various biases; for example, survey respondents may not be able to accurately remember personal information or experiences. Respondents may also be less inclined to report socially stigmatized conditions or behaviors. Furthermore, it is likely that the BRFSS SOGI questions underestimate the prevalence of the population that is part of the LGB+ community, as respondents may not feel comfortable self-identifying as a member of a sexual minority group. Additionally, SOGI measures that provide more comprehensive identity label options may allow for further breakdown of identities and deeper understanding of groups based on sexual orientation. In addition, the BRFSS does not survey homeless adults and adults residing in institutional settings, so the findings do not include data for sexual minorities from these vulnerable subgroups. Lastly, the decision to remove all missing data from any analyses could result in biased estimates.

CONCLUSIONS

This study provides further evidence of disparities in health risk behaviors and outcomes for sexual minorities, specifically among those living in Indiana. These findings can be used to enact policy changes and increase public health interventions within the state to address these systemic disparities. Prior research has demonstrated that interventions and policy changes focused on reducing minority stress have great potential to improve sexual minority health.²² When this is not feasible, interventions that build resiliency and social support can also have a meaningful impact.^{16,22}

Incorporation of SOGI questions into large studies like the BRFSS allows for more granular analyses at the national level; however, it can sometimes be difficult to examine subgroups when only using state-

level data. Moving forward, researchers should continue to add SOGI questions to state- and county-level health surveys so health outcomes for sexual minorities can be analyzed in-depth at the community and state levels. Future research should further explore the underlying causes of poor health outcomes among sexual minorities in Indiana, as well as analyze outcomes for sexual minorities from different socioeconomic, racial/ethnic and geographic backgrounds.

By seeking to understand how minority stress and other factors differ by sexual identity in the state of Indiana, public health responses can be better informed to address the health disparities within these populations, as community-level interventions tend to work best when tailored to reflect specific needs based on age, gender, geography and race/ethnicity.⁴ Along with focusing on individual behavior change, it is important that health promotion interventions to reduce health risk behaviors and improve health outcomes within the LGB+ population acknowledge and address the structural and environmental context in which sexual minorities live. Overall, through public policy changes, community-level interventions and continued research, Indiana can take steps toward achieving LGB+ health equity.

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