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Prevalence and Sociodemographic and Behavioral Correlates of Psychological Distress among Lesbian, Gay, and Bisexual Adults in the United States, 2013-2018

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ABSTRACT

Background: The lesbian, gay, bisexual, and transgender (LGBT) population comprises approximately 5.6% of the total US population. Levels and patterns of psychological distress in the LGBT population are less well known compared with the general population. This study examines the prevalence and sociodemographic and behavioral correlates of psychological distress among lesbian, gay, and bisexual (LGB) adults in the United States.

Methods: Using the pooled cross-sectional data from the 2013-2018 National Health Interview Surveys (N=183,020), differentials in serious psychological distress (SPD) and factor-based psychological distress scores were analyzed by multivariate linear and logistic regression.

Results: The prevalence of SPD was 8.0% for the LGB population aged ≥18, 7.0% for gay and bisexual males, and 8.9% for LGB females, compared with 3.4% for the total straight/heterosexual population, 2.7% for straight males, and 4.0% for straight females. Mean psychological distress index scores were highest among LGB females (109.8), followed by gay and bisexual males (105.8), straight females (100.6), and straight males (97.7). Compared with the straight population, LGB adults had higher education, unemployment, and poverty levels and were more likely to be non-Hispanic White and single. LGB adults were more likely to smoke and drink alcohol and more likely to be physically active than straight adults. LGB females had higher obesity but gay and bisexual males had lower obesity rates than their straight counterparts. After controlling for covariates, LGB adults had 89% higher odds of SPD and significantly higher distress levels than straight adults. Younger age, lower-income, divorce/separation, lack of health insurance, functional limitation, smoking, physical inactivity, and obesity were significant predictors of SPD and higher psychological distress levels in LGB adults.

Conclusion and Implications for Translation: Significant disparities in mental health exist, with LGB adults at substantially increased risk of psychological distress and likely in greater need of appropriate social and mental health services. Health policies aimed at improving the material conditions and social environments may lead to improved mental health outcomes among LGB adults and the general population.

Keywords: • LGB • Mental Health • Psychological Distress • Ethnicity • Socioeconomic Status • Disparities • Health Behaviors • United States

1. Introduction

Mental health problems exact a substantial toll on the overall health and well-being of adolescents, youth, and adults and are leading causes of morbidity and mortality in the United States.[1,2] Healthcare and social costs associated with mental health problems are also considerable.[3,4] There are significant disparities in mental health outcomes according to gender, race/ethnicity, socioeconomic status (SES), rural-urban residence, disability status, and health-risk behaviors.[5–10] Because of a relatively high prevalence, large social-group disparities, and substantial health impact, mental disorders, including non-specific psychological distress, are recognized as major public health issues in the US and many other industrialized countries.[2,4,11–13]

While data on psychological distress and specific mental disorders for US adults are routinely available by age, gender, race/ethnicity, and SES,[5–8] prevalence estimates by sexual orientation such as those for lesbian, gay, bisexual, and transgender (LGBT) adults or the subgroup of lesbian, gay, bisexual (LGB) adults are less well known and had not been available at the national level until recently.[6,14–16] The broader LGBT population is a sizable community, comprising approximately 5.6% of the total US population.[17] In this study, we focus on LGBs instead of the broader LGBT group because most national databases, including the National Health Interview Survey on which this study is based, do not include information on gender identity, and hence transgender adults could not be included along with LGBs in the analysis.[18,19]

In addition to the limited information on prevalence, social determinants of mental health outcomes among lesbian, gay, bisexual (LGB) adults and the underlying psychosocial and behavioral mechanisms are not well studied. It is not known whether the sociodemographic and behavioral correlates of psychological distress among LGB adults are similar to those observed for the general population. Few prior studies have shown that LGB adults experience higher levels of psychological distress and elevated risks of social stigmatization, discrimination, personal stress, low social and familial support, and health-risk behaviors than the straight/heterosexual or general population.[6,18,20–22] To address the research gaps in the literature, we use recent data from the National Health Interview Survey[23] to examine variations in psychological distress in the US according to sexual orientation and other social, demographic, and behavioral determinants and to identify specific groups of LGB adults who may be at increased risk of psychological distress and who may therefore require appropriate social and mental healthcare services. Specifically, we: (1) examine prevalence and levels of psychological distress among LGB adults in the US and compare these estimates with those for the straight/heterosexual population using large, nationally representative samples of US adults and (2) examine a wide range of socioeconomic, demographic, and behavioral predictors of psychological distress among LGB adults and the general US population.

2. Methods

2.1. Data

Pooled cross-sectional data on mental health and selected socioeconomic, demographic, and behavioral characteristics for LGB and straight/heterosexual populations were derived from the 2013-2018 National Health Interview Surveys (NHIS).[23,24] The NHIS is a national sample household survey in which data on socioeconomic, demographic, behavioral, morbidity, health, and healthcare characteristics are collected via personal household interviews.[7,23,24] All information collected in the survey is based on self-reports. The NHIS uses a complex, multistage probability design and is representative of the civilian non-institutionalized population of the United States. The NHIS, one of the longest-running federal health surveys, has been conducted annually since 1957 by the National Center for Health Statistics.[24] Response rate for an annual NHIS generally exceeds 87%. Data are obtained via in-home person interviews.[23,24] Substantive and methodological details of the NHIS are described elsewhere.[7,23,24]

2.2. Measurement of Psychological Distress (Dependent Variable)

We pooled 6 years of NHIS data from 2013-2018 to ensure sufficient sample sizes for analyzing

mental health patterns by LGB status and other sociodemographic characteristics. The latest NHIS data were available for 2019 and 2020, but they did not include information on psychological distress and several of the covariates, such as occupation, alcohol use, and physical activity, used in our study.[23] Differentials in mental health outcomes were analyzed for 183,020 adults aged ≥18 in 2013-2018 for whom information on psychological distress and sexual orientation was available. Psychological distress was based on 6 questions that asked respondents how often during the past 30 days they felt (1) so sad that nothing could cheer them up, (2) nervous, (3) restless or fidgety, (4) hopeless, (5) that everything was an effort, or (6) worthless.[7,23] Each question had 5 response categories: all of the time (coded 4), most of the time (coded 3), some of the time (coded 2), a little of the time (coded 1), or none of the time (coded 0). The response values to these six items were summed to create a scale (K6), ranging in value from 0 to 24, with a score of 13 or more used to define serious psychological distress (SPD).[4,5,8,25,26]

In addition to the dichotomous measure, we defined psychological distress as a continuous, composite index. The psychological distress index was constructed using principal components analysis of the above six items for all 183,020 adults aged ≥18. The factor loadings for the index items were as follows: sadness (0.79), nervousness (0.75), restlessness (0.73), hopelessness (0.83), everything an effort (0.77), and worthlessness (0.78). The index had a high-reliability coefficient (Cronbach's alpha=0.87). The psychological distress index scores ranged from a low of 87.18 to a high of 210.27 (mean=100; SD=20). Higher scores on the index indicate higher levels of psychological distress.

2.3. Definition of Sexual Orientation, the Primary Covariate of Interest (Independent Variable)

Starting with the 2013 NHIS, respondents were, for the first time, asked questions about their sexual orientation, the primary covariate of interest in the study. Male respondents were asked: "Which of the following represents how you think of yourself: (1) gay; (2) straight, that is not gay; (3) bisexual; (4) something else; (5) I don't know the answer?" Female respondents were asked: "Which of the following represents how you think of yourself: (1) lesbian or gay; (2) straight, that is not lesbian or gay; (3) bisexual; (4) something else; (5) I don't know the answer?" For this study, we defined sexual orientation as a dichotomous variable by combining "gay or lesbian and bisexual" as one single category of LGB men and women and the second category consisting of straight/heterosexual individuals. Those with missing data on sexual orientation and with responses of "something else" and "I don't know the answer" were excluded from the analysis,[23] resulting in an effective/final sample size of 183,020 for analysis.

2.4. Sociodemographic and Behavioral Covariates

Based on prior research, we considered the following sociodemographic and behavioral factors that are known to influence mental health outcomes: age, gender, race/ethnicity, immigrant status, marital status, region of residence, educational attainment, family income/poverty status, occupation, housing tenure, activity limitation, smoking, alcohol consumption, physical activity (PA), and obesity/overweight status.[1,2,5–10,12] Race/ethnicity was classified into 5 major categories: non-Hispanic Whites, non-Hispanic Blacks/African Americans, American Indians/Alaska Natives (AIANs), Asian/Pacific Islanders (APIs), and Hispanics. US-born were those born in one of the 50 US states or Washington, DC. Immigrants or foreign-born referred to those born outside these territories.

Educational attainment was measured by four categories: <12, 12, 13-15, ≥16 years of completed schooling. Income/poverty level, measured as the ratio of annual family income to the federal poverty threshold, was defined by 5 categories, ranging from <100% to ≥500% of the poverty level. Occupational class was defined in terms of 5 broad categories: professional and managerial occupations, sales/clerical and technical support occupations, service, craft and repair, and laborers. These occupational groups, derived from the major occupational groups defined by the US Census Bureau, are consistent with previously defined social class positions of upper white-collar, lower white-collar, upper blue-collar,

and lower blue-collar jobs.[27] All other covariates were measured as shown in Tables 1 and 2. Less than 2.7% of observations for all variables except income/poverty level were missing. For income/poverty level, the proportion missing values was 7.2%. We included in the analysis covariate categories for all missing values in order to avoid losing a substantial number of observations due to listwise deletion.

2.5. Statistical Methods

Multivariate logistic regression was used to examine the association between the binary outcome of SPD and sexual orientation before and after controlling for selected socioeconomic and demographic factors. Since the composite psychological distress index was a continuous variable, least squares regression was used to model mean psychological distress index scores. Interactions effects on psychological distress of sexual orientation with race/ethnicity, education, and poverty levels were examined, leading to race/ethnicity-, education-, and poverty-level-specific stratified models of psychological distress. Additionally, sociodemographic and behavioral predictors of SPD and mean psychological distress scores were examined by limiting the sample to LGB adults only. Adjusted prevalence or mean scores were derived from the fitted logistic and least-squares models respectively. To account for the complex sample design of the NHIS, SUDAAN software was used to conduct all statistical analyses.[28] The psychological distress index was created using the SAS Factor procedure.[29] The Chi-square statistic was used to test the overall association between each covariate and psychological distress, while the two-sample *t* test was used to test the difference in prevalence or mean scores between any two groups.

3. Results

3.1. Sociodemographic Characteristics of LGB and Straight Populations

LGB and straight populations differed significantly in their sociodemographic and behavioral characteristics. Compared with the straight population, LGB adults were more likely to be younger, non-Hispanic White, US-born, single, and had higher education, unemployment, and poverty levels (Table 1). Compared with the straight population, LGB adults were more likely to smoke and drink alcohol but less likely to be physically inactive than straight adults. LGB females had higher obesity but gay and bisexual males had lower obesity rates than their straight counterparts (Table 1).

3.2. Disparities in SPD Prevalence and Mean Psychological Distress Scores

The prevalence of SPD was 8.0% for the LGB population aged ≥18, 7.0% for gay and bisexual males, and 8.9% for LGB females, compared with 3.4% for the total straight/heterosexual population, 2.8% for straight males, and 3.9% for straight females (Table 2). In the general population, SPD prevalence varied from 1.6% for API males to 11.4% for AIAN males. After controlling for sociodemographic characteristics including gender, SES, health insurance, and functional limitation, LGB adults had 101% higher odds of SPD than their straight counterparts (Table 3). Adjusting for additional risk factors such as smoking, drinking, physical inactivity, and obesity/overweight reduced differentials only slightly; LGB adults still had 89% higher odds of SPD than straight adults (Table 3). After adjusting for sociodemographic and behavioral characteristics, compared to their straight counterparts, gay or bisexual males had 151% higher odds of SPD (OR=2.51; 95% CI=1.86-3.40) and LGB females had 60% higher odds of SPD (OR=1.60; 95% CI=1.31-1.96) [data not shown].

Mean psychological distress index scores were highest among LGB females, followed by gay and bisexual males, straight females and males (Table 4). When stratified by race/ethnicity, mean psychological distress index scores varied from 96.8 for straight APIs to 118.5 for gay and bisexual AIANs. After adjusting for sociodemographic and behavioral characteristics, gay or bisexual males had significantly higher psychological distress levels than straight males (mean psychological distress index score=104.3 vs. 97.7) and LGB females had significantly higher psychological distress levels than straight females (mean index score=106.4 vs. 100.7).

Other sociodemographic characteristics were associated with psychological distress in an expected manner (Tables 2-4). Those aged ≥65 years had the

Table 1: Descriptive socioeconomic, demographic, and behavioral characteristics of LGB (Lesbian, Gay, or Bisexual) and Straight/Heterosexual populations aged ≥18 years in the United States: The National Health Interview Survey, 2013-2018

Covariates	Both Sexes (N = 183,020)				Male (N = 82,452)				Female (N = 100,568)			
	LGB		Straight		Gay or bisexual		Straight		LGB		Straight	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Age (years)												
18-24	22.05	0.96	11.93	0.16	17.86	1.27	12.63	0.22	25.50	1.33	11.28	0.19
25-34	25.08	0.83	17.46	0.15	23.39	1.22	17.96	0.22	26.47	1.13	17.00	0.18
35-44	15.64	0.66	16.63	0.13	15.12	0.94	16.93	0.19	16.08	0.95	16.35	0.18
45-54	17.73	0.75	17.45	0.13	20.45	1.16	17.62	0.18	15.48	0.94	17.29	0.17
55-64	11.90	0.61	16.78	0.14	13.92	0.88	16.66	0.18	10.24	0.82	16.90	0.17
65+	7.60	0.44	19.75	0.18	9.27	0.76	18.21	0.20	6.22	0.50	21.19	0.22
Gender												
Male	45.18	1.03	48.39	0.16								
Female	54.82	1.03	51.61	0.16								
Race/ethnicity												
Non-Hispanic White	66.75	1.07	65.50	0.48	67.28	1.66	65.94	0.51	66.32	1.45	65.08	0.51
Non-Hispanic Black	12.31	0.7	11.89	0.27	10.71	0.94	11.14	0.27	13.63	0.98	12.59	0.31
American Indian/Alaska Native	1.01	0.23	0.77	0.09	0.61	0.16	0.76	0.09	1.33	0.40	0.78	0.10
Asian/Pacific Islander	3.68	0.42	6.00	0.16	4.03	0.56	5.78	0.17	3.40	0.62	6.20	0.18
Hispanic	15.36	0.88	15.66	0.39	16.55	1.36	16.21	0.43	14.38	1.06	15.15	0.39
All other ethnic groups	0.89	0.28	0.18	0.01	0.82	0.44	0.17	0.02	0.94	0.35	0.20	0.02
Immigrant status												
Foreign-born	10.92	0.65	18.59	0.32	12.81	1.06	18.71	0.35	9.37	0.79	18.48	0.35
Marital status												
Married	43.46	0.98	61.24	0.21	39.47	1.41	64.05	0.26	46.74	1.34	58.60	0.26
Widowed	1.33	0.15	6.01	0.07	1.17	0.22	2.79	0.06	1.47	0.23	9.03	0.12
Divorced/separated	8.39	0.45	11.28	0.1	7.07	0.65	9.59	0.13	9.49	0.62	12.86	0.13
Single	46.82	1.00	21.47	0.19	52.30	1.42	23.57	0.25	42.30	1.37	19.50	0.23
Geographic region												
Northeast	17.71	0.92	17.61	0.40	18.54	1.27	17.24	0.41	17.02	1.16	17.95	0.44
Midwest	20.17	0.94	22.43	0.56	18.72	1.26	22.79	0.57	21.37	1.24	22.09	0.59
South	34.62	1.18	36.74	0.68	32.86	1.57	36.23	0.70	36.07	1.48	37.22	0.70
West	27.50	1.14	23.22	0.53	29.88	1.61	23.74	0.56	25.54	1.34	22.74	0.53
Education (years of school completed)												
<12	8.54	0.63	12.51	0.19	6.88	0.84	12.92	0.22	9.91	0.92	12.13	0.21
12	20.05	0.85	25.19	0.20	19.22	1.28	26.21	0.27	20.73	1.06	24.23	0.23
13-15	33.63	0.99	30.71	0.20	31.97	1.41	29.56	0.26	34.99	1.30	31.79	0.24
16+	37.79	1.02	31.59	0.32	41.93	1.41	31.31	0.37	34.38	1.29	31.85	0.34

(Contd....)

Table 1: ***(Continued)***

Covariates	Both Sexes (N = 183,020)				Male (N = 82,452)				Female (N = 100,568)			
	LGB		Straight		Gay or bisexual		Straight		LGB		Straight	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Poverty status (ratio of family income to poverty threshold)												
Below poverty level	16.70	0.75	12.29	0.18	12.93	0.99	10.61	0.20	19.82	1.02	13.87	0.22
Occupation												
Professional/managerial	36.35	1.09	30.73	0.26	41.19	1.48	30.85	0.33	32.20	1.36	30.61	0.27
Sales/clerical/technical support	32.95	0.91	30.76	0.16	27.38	1.21	18.33	0.19	37.71	1.33	42.87	0.23
Service	18.54	0.83	15.27	0.15	15.74	1.11	13.85	0.20	20.93	1.17	16.66	0.20
Craft and repair	7.31	0.54	15.37	0.17	10.22	0.96	24.97	0.27	4.82	0.56	6.03	0.13
Laborers	3.93	0.38	5.90	0.09	4.76	0.61	9.55	0.16	3.21	0.44	2.34	0.07
All other occupations	0.93	0.19	1.97	0.06	0.70	0.28	2.45	0.08	1.12	0.27	1.51	0.06
Employment status												
Unemployed	9.08	0.66	6.04	0.11	8.50	1.02	6.14	0.15	9.57	0.87	5.92	0.14
Housing tenure												
Own house	49.90	1.06	66.47	0.30	52.39	1.48	67.00	0.35	47.85	1.41	65.97	0.33
Renter	50.10	1.06	33.53	0.30	47.61	1.48	33.00	0.35	52.15	1.41	34.03	0.33
Health insurance status												
Uninsured	12.95	0.63	11.62	0.17	11.95	0.89	13.24	0.22	13.78	0.88	10.11	0.18
Functional Limitation												
Limited in activity	18.18	0.74	15.90	0.17	15.79	1.01	14.97	0.2	20.14	1.08	16.78	0.19
Current smoking status												
Current smoker	21.87	0.83	15.26	0.17	21.57	1.19	17.36	0.22	22.11	1.15	13.30	0.19
Alcohol drinking status												
Lifetime abstainer	13.03	0.70	20.27	0.23	9.37	0.90	15.15	0.24	16.03	1.07	25.05	0.3
Former drinker	9.51	0.51	14.01	0.13	8.96	0.73	14.25	0.19	9.96	0.75	13.80	0.16
Current light/infrequent drinker	49.30	0.94	44.85	0.2	45.70	1.46	42.32	0.26	52.26	1.31	47.21	0.26
Current moderate/heavy drinker	28.15	0.88	20.87	0.19	35.97	1.37	28.28	0.25	21.75	1.06	13.94	0.2
Leisure-time physical activity												
Inactive	22.80	0.88	28.87	0.32	21.60	1.28	26.70	0.35	23.78	1.17	30.90	0.36
Engaged in some activity	34.17	0.99	32.49	0.24	31.64	1.39	31.82	0.28	36.24	1.37	33.12	0.28
Regular activity	43.03	1.02	38.64	0.23	46.75	1.57	41.47	0.29	39.98	1.27	35.98	0.28
Body Mass Index (BMI)/weight status												
Obesity (BMI ≥ 30)	32.85	0.92	30.04	0.20	25.42	1.25	30.36	0.25	39.08	1.31	29.73	0.25
Overweight/obesity (BMI ≥ 25)	61.98	0.94	64.64	0.19	60.80	1.34	71.07	0.23	62.97	1.31	58.40	0.26

SE=standard error. All Chi-square tests for differences in characteristics by sexual orientation (except for health insurance status and activity limitation for men and region for women) were statistically significant at $P<0.05$.

lowest odds of SPD and levels of psychological distress than adults in younger age groups. AIANs and Hispanics had significantly higher SPD prevalence (10.5% and 4.2% respectively) than non-Hispanic Whites, while APIs had a significantly lower prevalence of SPD (1.8%). Adjusting for

Table 2: Observed weighted prevalence of Serious Psychological Distress (SPD)[1] by sexual orientation, sociodemographic, and behavioral characteristics, US population aged ≥18 years: The National Health Interview Survey, 2013-2018 (N=183,020)

Covariates	Both Sexes		Male		Female	
	%	SE	%	SE	%	SE
Time period						
2013	3.83	0.15	3.23	0.19	4.39	0.21
2014	3.14	0.12	2.68	0.16	3.57	0.16
2015	3.60	0.17	2.88	0.21	4.27	0.23
2016	3.56	0.16	3.23	0.19	4.39	0.21
2017	3.38	0.14	2.68	0.16	3.57	0.16
2018	3.89	0.17	2.88	0.21	4.27	0.23
Age (years)						
18-24	3.24	0.20	2.25	0.31	3.84	0.46
25-34	3.23	0.15	3.01	0.29	3.46	0.25
35-44	3.54	0.14	2.85	0.22	4.36	0.26
45-54	4.48	0.16	3.63	0.26	4.87	0.27
55-64	4.44	0.16	3.81	0.32	5.14	0.3
65+	2.54	0.10	1.86	0.19	2.95	0.21
Sexual orientation						
LGB	8.02	0.54	6.98	0.81	8.87	0.68
Straight	3.38	0.07	2.70	0.08	4.01	0.09
Gender						
Male	2.85	0.08				
Female	4.24	0.10				
Race/ethnicity						
Non-Hispanic White	3.53	0.08	2.80	0.14	4.00	0.16
Non-Hispanic Black	3.74	0.18	3.40	0.31	3.80	0.27
American Indian/Alaska Native	8.81	1.33	11.41	3.24	9.80	3.48
Asian/Pacific Islander	1.86	0.17	1.60	0.34	2.05	0.26
Hispanic	3.96	0.15	3.24	0.25	5.14	0.26
All other ethnic groups	6.07	1.44	4.70	2.71	6.65	3.66
Duration of residence in the US (years)						
<15	1.98	0.16	1.67	0.28	2.60	0.29
15+	3.34	0.16	2.72	0.28	4.36	0.32
US-born	3.72	0.08	3.06	0.13	4.15	0.14
Marital status						
Married	2.59	0.07	2.24	0.13	3.12	0.13
Widowed	4.30	0.22	3.34	0.65	4.32	0.33
Divorced/ separated	6.87	0.21	5.68	0.39	7.50	0.36
Single	4.37	0.16	3.59	0.27	4.51	0.31
Geographic region						
Northeast	3.07	0.16	2.56	0.26	3.17	0.24
Midwest	3.60	0.15	3.08	0.28	4.13	0.26
South	3.75	0.12	3.09	0.18	4.27	0.21
West	3.63	0.14	2.80	0.23	4.41	0.26
Education (years of school completed)						
<12	6.79	0.23	5.93	0.39	8.37	0.46
12	4.49	0.14	3.71	0.25	4.63	0.25
13-15	3.75	0.11	2.73	0.20	4.47	0.20
16+	1.38	0.06	1.07	0.11	1.40	0.12
Poverty status (ratio of family income to poverty threshold)						
<100%	9.26	0.25	7.92	0.51	10.05	0.40
100-199%	5.76	0.18	5.20	0.34	5.84	0.29
200-299%	3.49	0.15	2.68	0.28	3.92	0.30
300-399%	2.55	0.16	1.88	0.25	2.49	0.27
400-499%	1.90	0.14	1.47	0.29	2.14	0.27
≥500%	1.11	0.07	0.96	0.13	1.19	0.15
Unknown	2.62	0.19	2.02	0.33	2.94	0.34
Occupation						
Professional/ managerial	1.88	0.08	1.37	0.14	2.29	0.18
Sales/clerical/ technical support	3.62	0.11	2.25	0.21	3.72	0.17
Service	5.23	0.18	3.86	0.32	6.46	0.32
Craft & repair	4.28	0.17	3.82	0.26	6.40	0.55
Laborers	4.60	0.28	4.63	0.47	5.56	0.79
All other occupations	3.10	0.43	2.74	0.70	2.43	0.67
Unemployed/ not in labor force	5.17	0.32	4.94	0.78	5.59	0.51
Housing tenure						
Own house	2.68	0.07	2.31	0.14	2.90	0.13
Renter	5.29	0.13	4.15	0.2	6.31	0.21

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Table 2: ***(Continued)***

Covariates	Both Sexes		Male		Female	
	%	SE	%	SE	%	SE
Insurance status						
Uninsured	5.48	0.2	4.30	0.31	6.97	0.44
Insured	3.32	0.07	2.68	0.12	3.69	0.12
Functional Limitation						
Limited in activity	12.53	0.28	12.04	0.61	13.00	0.45
Not limited in activity	1.86	0.05	1.36	0.08	2.33	0.11
Current smoking status						
Current smoker	8.47	0.22	7.22	0.4	9.71	0.41
Former smoker	3.36	0.12	2.31	0.18	3.88	0.25
Never smoker	2.43	0.06	1.79	0.11	2.90	0.12
Alcohol drinking status						
Lifetime abstainer	3.40	0.13	2.23	0.23	3.76	0.21
Former drinker	5.88	0.2	5.46	0.36	6.38	0.37
Current light/ infrequent drinker	3.34	0.09	2.52	0.16	3.79	0.18
Current moderate/ heavy drinker	2.65	0.11	2.55	0.21	3.18	0.26
Leisure-time physical activity						
Inactive	5.92	0.15	4.82	0.25	6.44	0.25
Engaged in some activity	3.27	0.11	2.65	0.19	3.42	0.18
Regular activity	2.04	0.07	1.71	0.14	2.46	0.15
Body Mass Index (BMI)/weight status						
Normal weight (BMI<25)	3.16	0.1	3.11	0.2	3.16	0.17
Overweight (25<=BMI<30)	2.83	0.09	2.30	0.14	3.79	0.19
Obesity (BMI>=30)	4.84	0.13	3.61	0.21	5.64	0.24

SE=standard error.[1]SPD is measured by a 6-item scale (K6) that asks respondents how often they experienced each of 6 symptoms of psychological distress in the past 30 days (feelings of sadness, nervousness, restlessness, hopelessness, everything an effort, worthlessness). The K6 varies from 0 to 24, with a score of 13 or more used to define SPD. All Chi-square statistics for testing the overall association between each covariate and SPD prevalence were statistically significant at $P<0.05$.

socio-behavioral characteristics reduced racial/ethnic differentials in SPD prevalence, with only non-Hispanic Blacks experiencing 30% lower adjusted odds of SPD than non-Hispanic Whites (Table 3, Model 3). Immigrants with <15 years of residence in the US had 32% lower adjusted odds of SPD than US-born adults. Education, income, and homeownership were inversely related to SPD and psychological distress index scores, while smoking, alcohol consumption, physical inactivity, and obesity were associated with increased risks of SPD and with higher psychological distress index scores.

3.3. Predictors of SPD and Psychological Distress Level in LGB Adults

Younger age, unmarried status and marital disruption, lower-income, divorce/separation, lack of health insurance, functional limitation, smoking, physical inactivity, and obesity were significant predictors of SPD and higher psychological distress levels in LGB adults (Table 5). LGB adults under the age of 45 had more than 5.6 times higher adjusted odds of SPD than LGB adults aged ≥65. Mean psychological distress scores were substantially higher among LGB adults aged under 35 than among LGB adults aged ≥65 (110.8 vs. 96.5). LGB adults who experienced divorce or separation had 2.2 higher adjusted odds of SPD than their married counterparts. Poverty was strongly linked to SPD and higher psychological distress levels in LGB adults. SPD prevalence and psychological distress scores were 18.3% and 118.6, respectively, for LGB adults below the poverty level, compared with 1.8% and 99.1 for LGB adults with income ≥500% of the poverty level (Table 5). After adjusting for covariates, LGB adults below the poverty level and with income at 100-199% of the poverty level had 6.9 and 4.9 times higher odds of SPD respectively than LGB adults with income at ≥500% of the poverty level.

LGB adults who did not have health insurance had 2.0 times higher odds of SPD than LGB adults who did. Psychological distress levels were nearly 9 points higher among LGB adults lacking health insurance. LGB adults with a functional limitation or disability had 3.2 times higher adjusted odds of SPD and a 15-points higher distress score than LGB adults with a limitation. LGB smokers had 86% adjusted higher odds of SPD and a 6-points higher distress score than LGB non-smokers. Physically inactivity

Table 3: Unadjusted and adjusted odds of Serious Psychological Distress (SPD)[1] by sexual orientation, sociodemographic, and behavioral characteristics, US population aged 18+years: The National Health Interview Survey, 2013-2018 (N = 180,558)

Covariates	Model 1[2]			Model 2[3]			Model 3[4]		
	OR	95% CI		OR	95% CI		OR	95% CI	
Time period									
2013	1.00	reference		1.00	reference		1.00	reference	
2014	0.81	0.74	0.90	0.82	0.74	0.91	0.82	0.74	0.91
2015	0.94	0.83	1.06	0.99	0.87	1.12	0.99	0.88	1.13
2016	0.93	0.82	1.04	0.96	0.85	1.08	0.96	0.85	1.09
2017	0.88	0.78	0.99	0.91	0.81	1.03	0.93	0.83	1.06
2018	1.02	0.90	1.14	1.08	0.96	1.22	1.11	0.98	1.25
Age (years)									
18-24	1.28	1.10	1.49	2.28	1.90	2.73	2.54	2.12	3.05
25-34	1.28	1.13	1.45	2.81	2.40	3.30	2.68	2.28	3.14
35-44	1.41	1.26	1.58	2.99	2.60	3.43	2.71	2.36	3.12
45-54	1.80	1.62	2.01	3.01	2.65	3.40	2.68	2.36	3.04
55-64	1.78	1.61	1.98	2.35	2.08	2.65	2.13	1.88	2.40
65+	1.00	reference		1.00	reference		1.00	reference	
Sexual orientation									
LGB	2.49	2.16	2.88	2.01	1.69	2.38	1.89	1.59	2.25
Straight	1.00	reference		1.00	reference		1.00	reference	
Gender									
Male	1.00	reference		1.00	reference		1.00	reference	
Female	1.51	1.41	1.61	1.51	1.39	1.63	1.54	1.42	1.67
Race/ethnicity									
Non-Hispanic White	1.00	reference		1.00	reference		1.00	reference	
Non-Hispanic Black	1.06	0.96	1.18	0.63	0.57	0.71	0.68	0.61	0.76
American Indian/Alaska Native	2.64	1.91	3.65	1.18	0.83	1.68	1.17	0.83	1.65
Asian/Pacific Islander	0.52	0.43	0.62	0.83	0.67	1.03	0.89	0.72	1.11
Hispanic	1.13	1.03	1.23	0.89	0.79	1.01	0.99	0.87	1.12
All other ethnic groups	1.77	1.07	2.91	1.22	0.67	2.24	1.17	0.64	2.16
Duration of residence in the US (years)									
<15	0.52	0.44	0.62	0.58	0.47	0.70	0.66	0.55	0.81
15+	0.89	0.81	0.99	0.92	0.80	1.06	1.06	0.92	1.22
US-born	1.00	reference		1.00	reference		1.00	reference	
Marital status									
Married	1.00	reference		1.00	reference		1.00	reference	
Widowed	1.69	1.50	1.90	1.07	0.92	1.23	1.09	0.94	1.26
Divorced/separated	2.77	2.56	3.00	1.39	1.26	1.54	1.34	1.22	1.48
Single	1.72	1.57	1.88	1.18	1.06	1.31	1.23	1.11	1.37
Geographic region									
Northeast	1.00	reference		1.00	reference		1.00	reference	
Midwest	1.18	1.03	1.35	1.05	0.92	1.21	1.03	0.90	1.19

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Table 3: ***(Continued)***

Covariates	Model 1[2]			Model 2[3]			Model 3[4]		
	OR	95% CI		OR	95% CI		OR	95% CI	
South	1.23	1.09	1.39	1.09	0.96	1.23	1.09	0.96	1.24
West	1.19	1.04	1.36	1.19	1.04	1.37	1.26	1.10	1.45
Education (years of school completed)									
<12	5.20	4.65	5.82	2.12	1.84	2.45	1.73	1.49	2.00
12	3.36	3.02	3.73	1.74	1.53	1.98	1.47	1.29	1.68
13-15	2.78	2.50	3.10	1.58	1.40	1.79	1.41	1.24	1.59
16+	1.00	reference		1.00	reference		1.00	reference	
Poverty status (ratio of family income to poverty threshold)									
<100%	9.06	7.88	10.41	3.10	2.63	3.65	2.72	2.31	3.21
100-199%	5.43	4.72	6.24	2.43	2.07	2.85	2.17	1.85	2.55
200-299%	3.21	2.76	3.74	1.91	1.62	2.25	1.75	1.48	2.06
300-399%	2.32	1.93	2.78	1.62	1.34	1.96	1.52	1.26	1.84
400-499%	1.72	1.42	2.07	1.43	1.18	1.73	1.38	1.14	1.67
≥500%	1.00	reference		1.00	reference		1.00	reference	
Unknown	2.39	1.96	2.91	1.51	1.22	1.86	1.40	1.14	1.73
Occupation									
Professional/managerial	1.00	reference		1.00	reference		1.00	reference	
Sales/clerical/technical support	1.96	1.78	2.17	1.10	0.98	1.23	1.06	0.95	1.18
Service	2.88	2.60	3.20	1.18	1.04	1.34	1.13	0.99	1.28
Craft & repair	2.33	2.08	2.62	1.19	1.03	1.37	1.11	0.96	1.28
Laborers	2.51	2.18	2.91	1.20	1.02	1.41	1.12	0.95	1.32
All other occupations	1.67	1.24	2.24	1.05	0.78	1.42	1.02	0.75	1.39
Unemployed/not in labor force	2.85	2.45	3.30	0.92	0.77	1.10	0.99	0.83	1.18
Housing tenure									
Own house	1.00	reference		1.00	reference		1.00	reference	
Renter	2.03	1.89	2.17	1.19	1.10	1.29	1.13	1.04	1.22
Health insurance status									
Uninsured	1.69	1.55	1.84	1.38	1.25	1.52	1.32	1.20	1.45
Insured	1.00	reference		1.00	reference		1.00	reference	
Functional Limitation									
Limited in activity	7.54	7.03	8.08	6.89	6.30	7.53	6.17	5.63	6.75
Not limited in activity	1.00	reference		1.00	reference		1.00	reference	
Current smoking status									
Current smoker	3.71	3.45	3.99				2.02	1.85	2.20
Former smoker	1.40	1.28	1.52				1.20	1.09	1.33
Never smoker	1.00	reference					1.00	reference	
Alcohol drinking status									
Lifetime abstainer	1.00	reference					1.00	reference	
Former drinker	1.77	1.61	1.95				1.31	1.17	1.47

(Contd....)

Table 3: ***(Continued)***

Covariates	Model 1[2]			Model 2[3]			Model 3[4]		
	OR	95% CI		OR	95% CI		OR	95% CI	
Current light/infrequent drinker	0.98	0.90	1.07				1.24	1.11	1.37
Current moderate/heavy drinker	0.77	0.69	0.87				1.15	1.01	1.32
Leisure-time physical activity									
Inactive	3.02	2.78	3.29				1.52	1.38	1.67
Engaged in some activity	1.62	1.48	1.78				1.23	1.12	1.36
Regular activity	1.00	reference					1.00	reference	
BMI/weight status									
Normal weight (BMI<25)	1.00	reference					1.00	reference	
Overweight (25<=BMI<30)	0.89	0.82	0.97				0.96	0.88	1.05
Obesity (BMI>=30)	1.56	1.44	1.68				1.18	1.08	1.29

OR=odds ratio; CI=confidence interval; BMI=body mass index. [1]SPD is measured by a 6-item scale (K6) that asks respondents how often they experienced each of 6 symptoms of psychological distress in the past 30 days (feelings of sadness, nervousness, restlessness, hopelessness, everything an effort, worthlessness). The K6 varies from 0 to 24, with a score of 13 or more used to define SPD. [2]Unadjusted for other covariates. [3]This logistic regression model includes survey year, age, sexual orientation, gender, race/ethnicity, length of immigration, marital status, region of residence, education, poverty status, occupation housing tenure, health insurance, and activity limitation as covariates. [4]This logistic regression model includes all covariates of Model 2 plus smoking, drinking, physical activity and BMI.

was associated with an 85% adjusted higher odds of SPD in LGB adults, while obesity was associated with a significant (4-point) increase in psychological distress level among LGB adults (Table 5).

4. Discussion

Our study has shown substantially higher risks of SPD and higher psychological distress levels among LGB adults in the US compared to their straight/heterosexual counterparts. Estimates of SPD prevalence and psychological distress levels for LGB adults had not been previously available at the national level, and a comparison of their mental health outcomes with the straight population had not been made by controlling for differences in sociodemographic and behavioral characteristics. Our study confirmed findings from previous studies that show significant socioeconomic and health disparities in mental health among LGB adults. Our study is one of the few studies that have examined mental health disparities in the LGB population by using nationally representative samples and by controlling a number of risk factors that are known to influence mental health outcomes. Documenting national estimates of psychological distress among LGB adults from various gender and racial/ethnic groups is new to the literature. Analysis of mental health disparities using a composite, continuous factor-based psychologic distress index is another novel feature of the study.

Our finding that LGB adults have approximately two times higher risks of SPD and psychological distress levels, compared with heterosexual adults, is consistent with previous studies. One paper using meta-analyses of 25 studies found that lesbian, gay, and bisexual people experienced at least 1.5 times higher risk for depression and anxiety disorders over a 12-month period or lifetime.[30] Recent studies using the Behavioral Risk Factor Surveillance System (BRFSS) also found that LGB adults were more likely to have 1.3 to 2.7 times more days with poor mental health, compared with heterosexual adults.[31,32] Studies using the National Survey on Drug Use and Health (NSDUH) found that LGB adults had a higher prevalence of drug use and any or severe mental illness including any mental, behavioral, or emotional disorder in the past year, compared with heterosexual adults.[15,16]

Our findings on differences in mental health status by intersectionality between sexual orientation and gender are consistent with previous findings that gay or bisexual males have higher odds of SPD than female LGBs. According to one study using the NHIS, gay and bisexual men and women were more likely to report severe psychological distress than heterosexual

Table 4: Observed and adjusted mean Psychological Distress Index scores by sexual orientation and its interactive effects with gender and race/ethnicity, US population aged 18+ years: The National Health Interview Survey, 2013-2018 (N = 183,265)

Interaction of LGB status with demographic covariates	Observed Psychological Distress Index				Adjusted[1] Psychological Distress Index Score			
	Mean Distress Index Score	SE	Expected Mean Difference in Distress score Regression Coefficient (β)	P-value (β)	Mean Distress Index Score	SE	Expected Mean Difference in Distress score Regression Coefficient (β)	P-value (β)
Sexual orientation								
LGB, total population	107.97	0.48	8.77	<.001	105.49	0.45	6.22	<.001
Straight, total population	99.20	0.09			99.26	0.09		
Sexual orientation X Gender								
LGB, male	105.81	0.70	8.13	<.001	104.25	0.68	6.54	<.001
Straight, male	97.68	0.10			97.72	0.10		
LGB, female	109.75	0.66	9.12	<.001	106.39	0.89	5.67	<.001
Straight, female	100.62	0.11			100.72	0.14		
Sexual orientation X Race/ethnicity								
LGB, Non-Hispanic White	107.82	0.56	8.50	<.001	105.06	0.51	5.67	<.001
Straight, Non-Hispanic White	99.31	0.10			99.39	0.10		
LGB, Non-Hispanic Black	109.37	1.40	10.09	<.001	106.49	1.31	7.14	<.001
Straight, Non-Hispanic Black	99.28	0.22			99.36	0.22		
LGB, American Indian/Alaska Native	118.51	5.00	14.98	0.002	113.77	5.35	10.08	<0.05
Straight, American Indian/Alaska Native	103.52	0.95			103.69	0.96		
LGB, Asian/Pacific Islander	100.35	2.17	3.54	0.102	98.89	2.05	2.05	0.320
Straight, Asian/Pacific Islander	96.81	0.24			96.83	0.24		
LGB, Hispanic	108.89	1.39	9.57	<.001	107.62	1.37	8.26	<.001
Straight, Hispanic	99.32	0.20			99.35	0.20		
Sexual orientation X Education level								
LGB, < High school	113.90	2.26	10.76	<.001	110.33	2.35	7.12	0.003
Straight, < High school	103.14	0.24			103.20	0.24		
LGB, High school	110.64	1.17	10.35	<.001	107.47	1.08	7.10	<.001
Straight, High school	100.30	0.16			100.37	0.16		
LGB, Some college	109.69	0.83	9.94	<.001	106.31	0.75	6.46	<.001
Straight, Some college	99.75	0.12			99.85	0.12		
LGB, College degree or higher	103.58	0.60	7.37	<.001	101.53	2.05	5.25	<.001
Straight, College degree or higher	96.21	0.10			96.28	0.24		
Sexual orientation X Income/poverty level								
LGB, <100% poverty	119.44	1.27	12.52	<.001	116.41	1.24	9.38	0.003
Straight, <100% poverty level	106.92	0.25			107.03	0.25		
LGB, 200-299% poverty level	108.92	1.52	9.35	<.001	106.89	1.52	7.28	<.001
Straight, 200-299% poverty level	99.57	0.16			99.61	0.16		
LGB, ≥500% poverty level	100.06	0.63	4.50	<.001	98.83	0.61	3.24	<.001
Straight, ≥500% poverty level	95.56	0.10			95.59	0.10		

SE=standard error. [1]Adjusted by least squares regression model for survey year, age, sexual orientation, gender, race/ethnicity, length of immigration, region of residence, education, marital status, poverty status, occupation, housing tenure, health insurance, activity limitation, smoking, drinking, physical activity, and BMI. The percent variance explained (R^2) for the adjusted model was 15.25 (total), 14.06 (male) and 15.73 (female). All Chi-square tests indicate statistically significant associations between each covariate and psychological distress levels at $p < 0.05$ in both observed and adjusted models, except for insurance status (p=0.06) in the adjusted model for men.

Table 5: Differentials in odds of Serious Psychological Distress (SPD) and Mean Psychological Distress Index Scores among LGB adults aged 18+ years, by sociodemographic and behavioral characteristics: The National Health Interview Survey, 2013-2018 (N = 4,881)

Covariates	Serious Psychological Distress (SPD)								Psychological Distress Score			
	Prevalence		Unadjusted[1]			Adjusted[2]			Unadjusted[2]		Adjusted[2]	
	%	SE	OR	95% CI		OR	95% CI		Mean	SE	Mean	SE
Age (years)												
18-24	9.48	1.24	4.77	2.47	9.23	8.01	3.53	18.20	111.64	1.10	113.22	1.17
25-34	8.62	1.08	4.29	2.24	8.23	6.42	2.94	14.04	110.60	0.95	110.75	0.98
35-44	8.03	1.17	3.97	1.95	8.08	5.62	2.43	13.01	108.17	1.06	108.28	1.05
45-54	9.18	1.40	4.60	2.33	9.10	5.56	2.61	11.85	107.08	1.34	106.75	1.16
55-64	6.03	1.20	2.92	1.42	6.01	2.83	1.28	6.25	103.21	1.24	101.14	1.17
65+	2.15	0.64	1.00	reference		1.00	reference		97.77	0.85	96.47	1.06
Gender												
Male	6.98	0.81	1.00	reference		1.00	reference		105.81	0.70	107.46	0.71
Female	8.87	0.68	1.30	0.97	1.73	1.01	0.73	1.40	109.75	0.66	108.38	0.61
Race/ethnicity												
Non-Hispanic White	7.67	0.60	1.00	reference		1.00	reference		107.82	0.56	108.48	0.58
Non-Hispanic Black	9.98	1.70	1.33	0.89	2.00	1.02	0.64	1.62	109.37	1.40	106.29	1.34
American Indian/Alaska Native	18.71	7.46	2.77	1.05	7.28	1.42	0.40	5.05	118.51	5.00	110.48	5.86
Asian/Pacific Islander	4.77	2.36	0.60	0.21	1.70	1.29	0.43	3.87	100.35	2.17	104.49	2.23
Hispanic	8.36	1.48	1.10	0.73	1.66	1.05	0.70	1.58	108.89	1.39	108.12	1.27
All other ethnic groups	1.97	2.03	0.24	0.03	1.91	0.19	0.02	1.57	103.65	2.66	102.28	2.41
Nativity/immigrant status												
<15	1.21	0.73	0.14	0.04	0.46	0.11	0.03	0.42	101.66	1.80	102.48	2.09
≥15	10.26	2.75	1.29	0.71	2.35	1.51	0.91	2.48	109.00	2.29	111.31	1.91
US-born	8.16	0.56	1.00	reference		1.00	reference		108.20	0.51	107.97	0.51
Marital status												
Married	5.63	0.64	1.00	reference		1.00	reference		104.88	0.64	107.25	0.69
Widowed	5.25	2.23	0.93	0.37	2.31	1.24	0.43	3.56	103.85	2.54	109.04	2.40
Divorced/separated	15.22	2.36	3.01	1.96	4.63	1.87	1.18	2.98	115.27	1.97	112.87	1.85
Single	9.01	0.80	1.66	1.25	2.21	1.16	0.82	1.63	109.62	0.72	107.69	0.70
Geographic region												
Northeast	6.41	1.06	1.00	reference		1.00	reference		106.36	1.04	107.63	0.98
Midwest	9.21	1.12	1.48	0.96	2.29	1.16	0.72	1.88	108.82	1.03	107.15	0.94
South	7.41	0.81	1.17	0.77	1.78	0.92	0.58	1.48	106.99	0.79	106.72	0.71
West	8.94	1.25	1.43	0.90	2.27	1.46	0.88	2.43	109.61	1.06	110.35	0.97
Education (years of school completed)												
<12	13.50	2.68	3.48	2.03	5.99	1.18	0.63	2.21	113.90	2.26	108.29	2.27
12	10.65	1.33	2.66	1.79	3.95	1.25	0.76	2.05	110.64	1.17	107.91	1.10
13-15	9.07	0.86	2.23	1.56	3.18	1.13	0.75	1.69	109.69	0.83	107.75	0.76
16+	4.29	0.62	1.00	reference		1.00	reference		103.59	0.60	108.07	0.79

(Contd....)

Table 5: ***(Continued)***

Covariates	Serious Psychological Distress (SPD)								Psychological Distress Score			
	Prevalence		Unadjusted[1]			Adjusted[2]			Unadjusted[2]		Adjusted[2]	
	%	SE	OR	95% CI		OR	95% CI		Mean	SE	Mean	SE
Poverty status (ratio of family income to poverty threshold)												
<100%	17.84	1.63	9.74	5.94	15.98	4.01	2.17	7.38	119.44	1.27	114.45	1.25
100-199%	12.88	1.42	6.63	3.97	11.08	3.32	1.80	6.12	114.11	1.21	110.93	1.17
200-299%	9.12	1.78	4.50	2.43	8.32	3.01	1.61	5.60	108.92	1.52	108.67	1.42
300-399%	5.31	1.33	2.52	1.27	4.99	1.81	0.92	3.60	106.08	1.32	106.53	1.26
400-499%	4.39	1.25	2.06	0.98	4.31	1.81	0.81	4.02	104.93	1.40	106.98	1.40
≥500%	2.18	0.49	1.00	reference		1.00	reference		100.06	0.63	103.60	0.81
Unknown	3.12	1.38	1.45	0.54	3.85	1.03	0.35	2.99	101.67	1.77	104.40	1.70
Occupation												
Professional/managerial	5.49	0.74	1.00	reference		1.00	reference		104.61	0.66	108.49	0.80
Sales/clerical/technical support	8.29	0.91	1.56	1.09	2.23	0.78	0.52	1.19	109.16	0.82	108.21	0.76
Service	12.96	1.68	2.56	1.72	3.82	0.96	0.61	1.50	112.05	1.44	107.86	1.28
Craft and repair	8.50	1.80	1.60	0.94	2.73	0.79	0.45	1.41	108.24	1.85	108.11	1.70
Laborers	5.21	1.73	0.95	0.45	1.99	0.32	0.15	0.72	109.18	2.29	105.99	2.23
All other occupations	2.00	1.66	0.35	0.06	1.90	0.20	0.03	1.23	101.28	3.50	104.24	2.61
Unemployed/not in labor force	8.71	3.00	1.64	0.74	3.63	0.60	0.26	1.42	109.07	2.60	105.27	2.56
Housing tenure												
Own house	5.26	0.69	1.00	reference		1.00	reference		103.82	0.69	107.69	0.80
Renter	10.76	0.81	2.17	1.58	2.98	1.05	0.72	1.53	112.12	0.67	108.26	0.69
Health insurance status												
Uninsured	12.74	1.77	1.86	1.32	2.62	1.56	1.06	2.31	114.34	1.50	111.69	1.49
Insured	7.27	0.54	1.00	reference		1.00	reference		106.98	0.50	107.37	0.52
Functional Limitation												
Limited in activity	20.95	1.64	4.86	3.69	6.42	3.87	2.78	5.40	123.69	1.30	121.90	1.24
Not limited in activity	5.17	0.51	1.00	reference		1.00	reference		104.49	0.47	104.89	0.49
Current smoking status												
Current smoker	15.15	1.34	2.65	1.97	3.56	1.55	1.08	2.22	115.04	1.15	110.35	1.11
Former smoker	5.36	0.79	0.84	0.57	1.23	0.85	0.56	1.30	105.96	0.84	107.88	0.84
Never smoker	6.32	0.69	1.00	reference		1.00	reference		106.04	0.62	107.09	0.63
Alcohol drinking status												
Lifetime abstainer	3.40	0.13	1.00	reference		1.00	reference		106.47	1.44	104.51	1.49
Former drinker	5.88	0.20	1.77	1.61	1.95	1.86	1.01	3.43	111.58	1.81	109.58	1.67
Current light/infrequent drinker	3.34	0.09	0.98	0.90	1.07	1.38	0.85	2.23	108.57	0.65	108.32	0.64
Current moderate/heavy drinker	2.65	0.11	0.77	0.69	0.87	1.35	0.74	2.44	106.45	0.84	108.53	0.86
Leisure-time physical activity												
Inactive	12.95	1.4	2.84	2.03	3.99	2.07	1.44	2.97	111.85	1.28	109.29	1.18
Engaged in some activity	8.16	0.94	1.70	1.20	2.40	1.52	1.04	2.22	108.69	0.81	108.46	0.76
Regular activity	4.97	0.6	1.00	reference		1.00	reference		105.16	0.59	106.68	0.62

(Contd....)

Table 5: ***(Continued)***

Covariates	Serious Psychological Distress (SPD)								Psychological Distress Score			
	Prevalence		Unadjusted[1]			Adjusted[2]			Unadjusted[2]		Adjusted[2]	
	%	SE	OR	95% CI		OR	95% CI		Mean	SE	Mean	SE
BMI/weight status												
Normal weight (BMI<25)	7.24	0.81	1.00	reference		1.00	reference		107.03	0.73	107.17	0.71
Overweight (25<=BMI<30)	6.90	0.98	0.95	0.65	1.39	1.10	0.74	1.62	105.31	0.90	107.17	0.85
Obesity (BMI>=30)	9.92	0.95	1.41	1.04	1.91	1.17	0.82	1.66	111.63	0.90	109.88	0.85

SE=standard error. OR=odds ratio; CI=confidence interval; BMI=body mass index. [1]Unadjusted for other covariates. [2]Adjusted by logistic or least squares regression model for survey year, age, gender, race/ethnicity, length of immigration, region of residence, marital status, education, poverty status, occupation, housing tenure, health insurance, activity limitation, smoking, drinking, physical activity, and BMI. The percent variance explained (R^2) in psychological distress scores for the adjusted least squares model was 20.36.

individuals, while lesbians were more likely to report moderate psychological distress.[14] The NSDUH study also found that gays and both male and female bisexual adults aged 50 and older were more likely to have mental illness compared with their heterosexual counterparts, but not lesbians.[16] Another study, focusing on LGBT cancer survivors, found that gay, bisexual, and transgender males had a higher prevalence of depressive symptoms than heterosexual males, whereas lesbian, bisexual, and transgender females were not significantly different from heterosexual females.[33] The BRFSS studies also showed higher odds of SPD for gays than lesbians.[31,32] Further studies are needed to estimate the intersectionality in SPD between sexual orientation and gender.

A higher prevalence of psychological distress among LGB might be explained by the *minority stress* model, under which excess in social stressors related to stigma and prejudice toward LGB populations is postulated to cause mental disorders among them.[22] Sexual orientation discrimination, stressful life events, and adverse childhood experiences among LGB individuals are associated with co-occurrence of alcohol or tobacco use disorder with anxiety, mood disorders, and posttraumatic stress disorder.[34] Considering minority stress during lifetime, various policy and clinical interventions might be helpful for mental health improvement among LGBs. For example, providing cognitive behavioral therapy or clinical care to youth with gender dysphoria, or a state-level anti-bullying law that enumerated sexual orientation as a protected class might reduce mental health problems among sexual and gender minority youth.[35]

4.1. Limitations

This study has some limitations. The K6 items in NHIS used to define psychological distress levels and SPD prevalence are based on self-reports, which may underestimate the actual prevalence of psychological distress among various sociodemographic groups, including LGB adults.[1] Second, the cross-sectional nature of the NHIS limits the estimation of the mental health impacts of socioeconomic variables and health-risk behaviors. However, the measures of psychological distress refer to the experiences during the 30 days preceding the survey, whereas some of the socioeconomic variables in the survey precede the psychological distress in their temporality. For example, family income/poverty level relates to the average income earned during the year preceding the survey. Similarly, education for most adults aged 30 and older is attained long before the time of the survey interview.

Third, self-reported data on the marital status by LGB adults in 2013 and 2014 NHIS may have been affected prior to the legalization of same-sex marriages in the US on June 26, 2015.[36] Fourth, information on stressors (such as social stigma, discrimination, personal stress, financial stress, relationship problems, job strain, and family health problems) underlying psychological distress among LGB adults is lacking in the NHIS, and data on social and familial support is also limited. Fifth, since mental health, health-risk factors, and social determinants are likely to vary for specific LGBT groups, studies of psychological distress need to consider disaggregated data for lesbians, gays, bisexuals, and

transgender people.[14,16,20] Finally, since NHIS did not include data on gender identity, we were unable to include transgender adults who have been shown to be significantly more disadvantaged in their social and health-risk profile, compared with lesbians, gays, and bisexuals.[18,19]

5. Conclusion and Implications for Translation

Significant disparities in mental health exist, with LGB adults at a substantially increased risk of psychological distress and likely in greater need of appropriate social and mental health services. Health policies aimed at improving the material conditions and social environments may lead to improved mental health outcomes among LGB adults and the general population. Evidence-based social and public health interventions to reduce psychological distress among LGB adults are lacking. Further research is urgently needed to address the mechanisms (such as social stigmatization, discrimination, and stress) through which social determinants influence mental health outcomes and psychological well-being among LBG adults across different racial/ethnic and socioeconomic groups.[18,22] Continued monitoring of social conditions and mental health disparities among sexual minorities is essential in tracking progress towards achieving the national goal of eliminating health inequities.[2,18] Increasingly, a number of national, state, and community health surveys have started to include variables on sexual orientation and gender identity, which should enable monitoring of health disparities and a better understanding of health, healthcare, and social needs of the LGB population.[18,37]

Compliance with Ethical Standards

Conflicts of Interest: *The authors declare that they have no conflict of interest.* ***Financial Disclosure:*** *None to report.* ***Funding/Support:*** *None.* ***Ethical approval:*** *No IRB approval was required for this study, which is based on the secondary analysis of a public-use federal database.* ***Acknowledgments:*** *None.* ***Disclaimer:*** *The views expressed are the authors' and not necessarily those of their institutions.*

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Key Messages

- The prevalence of SPD was 8.0% for LGB adults aged ≥18, 7.0% for gay and bisexual males, and 8.9% for LGB females, compared with 3.4% for the total straight/heterosexual population, 2.7% for straight males, and 4.0% for straight females.
- LGB adults had 89% higher adjusted odds of SPD and 6.2 points higher adjusted mean psychological distress score than straight adults.
- Wide disparities in psychological distress levels existed; mean psychological distress scores varied from 96.8 for straight APIs to 108.9 Hispanic LGBs, 109.4 for Black LGBs, and 118.5 for AIAN LGBs.
- Low-income LGB adults had a 23.9 points higher mean distress score than high-income straight adults.
- Younger age, lower-income, divorce/separation, lack of health insurance, functional limitation, smoking, physical inactivity, and obesity were significant predictors of SPD and higher psychological distress levels in LGB adults.

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