



An intersectional approach to examine sleep duration in sexual minority adults in the United States: findings from the Behavioral Risk Factor Surveillance System

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ABSTRACT

Objectives: Investigate sexual identity differences in sleep duration and the multiplicative effect of sexual identity and race/ethnicity among US adults.

Design: Cross-sectional.

Participants: The sample consisted of 267,906 participants from the Behavioral Risk Factor Surveillance System.

Measurements: Sleep duration was categorized as very short (≤ 4 hours), short (5–6 hours), adequate (7–8 hours), or long (≥ 9 hours). Sex-stratified multinomial logistic regressions were used to examine sexual identity differences in sleep duration. We then examined sleep duration by comparing sexual minorities to (1) same-race/-ethnicity heterosexuals and (2) White participants with the same sexual identity.

Results: Sexual minority women had higher odds of very short sleep compared to heterosexual women, regardless of race/ethnicity. Black gay men had higher rates of very short sleep but lower rates of long sleep relative to Black heterosexual men. Latino and Asian/Pacific Islander bisexual men reported higher rates of short sleep than their heterosexual counterparts. Black lesbian and other-race bisexual women were more likely to have very short sleep than their heterosexual peers. Black lesbian women also had higher rates of long sleep. Analyses examining racial/ethnic differences by sexual identity found that Black and Latino gay men reported higher rates of very short sleep compared to White gay men. Black bisexual women had higher rates of short sleep duration than White bisexual women.

Conclusions: More research is needed to understand how to promote sleep health among sexual minorities, particularly racial/ethnic minorities, and the impact of inadequate sleep duration on health outcomes in this population.

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Introduction

Over the past decade, sleep health has emerged as a significant public health concern. In 2010, sleep health became a national priority reflected in its addition as a Healthy People 2020 objective.¹ Disruption of physiological systems may occur as a result of sleep disturbances. These include, but are not limited to, insulin resistance,² inflammation,³ and hypothalamic-pituitary-adrenal axis reactivity.⁴ *Short sleep duration* (defined as ≤ 6 hours per night) is one form of sleep disturbance that is a risk factor for several health

conditions such as obesity, hypertension, and diabetes, as well as all-cause mortality.⁵ Alternatively, *long sleep duration* (defined as ≥ 9 hours per night) is more prevalent and may be of greater concern than short sleep duration.⁶ Several studies have shown a consistent U-shaped association between sleep duration and high blood pressure,⁷ stroke,⁸ and premature cardiovascular death.⁹

Sexual minorities can include individuals whose sexual identity is nonheterosexual (eg, lesbian, gay, bisexual, and other nonheterosexual) as well as those who report same-sex sexual behavior and/or same-sex attraction.¹⁰ In 2011, the National Academy of Medicine released a landmark report documenting the significant health disparities experienced by sexual minorities in the United States.¹¹ Among the most prominent health disparities are in mental health,^{12–14}

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tobacco use;^{15,16} and alcohol use, particularly among sexual minority women (SMW).¹⁷ In addition, SMW are more likely than heterosexual women to be obese.^{18,19} However, in general, much less research has focused on physical health in this population.

Although sexual minorities have higher rates of established risk factors for inadequate sleep duration than their heterosexual peers (eg, heavy drinking; poor mental health; and heightened exposure to victimization, stigma, and other stressors),^{20,21} there was insufficient research to warrant inclusion of sleep health in the 2011 National Academy of Medicine report on the health of lesbian, gay, bisexual, and transgender people.¹¹ Existing research on sleep duration in sexual minorities is conflicting. Three studies using data from the National Health Interview Survey found no sexual identity differences in sleep duration among men or women.^{22–24} However, in a study of young adults ages 24–32 years, Fricke and Sironi²⁵ found that bisexual men and “mostly lesbian” women reported higher rates of short sleep duration than their heterosexual counterparts. Similarly, analyses of data from the National Health and Nutrition Examination Survey found that bisexual women reported higher rates of short sleep duration relative to heterosexual women.²⁶ Given the limited and contradictory evidence on the state of sleep health in sexual minorities, more research is needed.

A robust body of research indicates that racial/ethnic minorities in the United States (including Blacks, Latinos, and Asian/Pacific Islanders) report higher rates of very short, short, and long sleep duration compared to Whites.^{27–31} The higher rates of inadequate sleep duration in racial/ethnic minorities are attributed to sociocultural factors including racial discrimination^{32,33} and acculturation stress.^{33,34} In addition, occupational factors (eg, shift work and job-related stress) that are linked with inadequate sleep duration may be more common among racial/ethnic minorities.^{35,36} Although Blacks consistently report higher rates of inadequate sleep duration, there is greater variability among Latinos. For instance, differences in sleep duration has been identified among Latinos based on nativity status (US vs foreign born), socioeconomic status, and heritage.^{30,34} Despite evidence of higher rates of inadequate sleep duration than Whites, fewer studies have examined sleep duration in Asian/Pacific Islanders in the United States^{29,31} or the influence of sociocultural factors on sleep duration in this population.³⁷ Although there is compelling evidence suggesting that racial/ethnic minorities have higher rates of inadequate sleep duration than Whites, a limitation of this work has been the lack of consideration of sexual identity.

Despite recognition of health disparities among sexual and racial/ethnic minorities, few studies have addressed the impact of these intersecting minority identities on health. This concept, called *intersectionality*, addresses the fact that multiple stigmatized identities are interrelated and may adversely impact health and well-being. Intersectionality is one of the recommended approaches to examining health disparities among sexual minorities; however, few studies have used an intersectional approach to examine health disparities and/or sleep health among sexual minorities.¹¹

Therefore, to address the significant gaps in the literature, we used data from the Behavioral Risk Factor Surveillance System (BRFSS) to investigate sexual identity differences in sleep duration and examine the multiplicative effect of sexual and racial/ethnic minority status on sleep duration. We posited that due to potentially greater exposure to minority stressors (eg, discrimination and victimization),^{38,39} participants who identified as both sexual minority and racial/ethnic minority would report higher rates of *inadequate sleep* (defined as very short, short, and/or long sleep duration) compared to their heterosexual counterparts of the same race/ethnicity and to White peers with the same sexual identity.

Participants and methods

Sample

We pooled data from the 2014 and 2016 BRFSS surveys. The 2015 and 2017 BRFSS surveys did not include a measure of sleep duration. The BRFSS is a nationally representative cross-sectional telephone survey initiated in 1984 to assess health behaviors, chronic conditions, and use of preventive services among adults in the United States. BRFSS collects data from more than 400,000 individuals every year in all 50 states, the District of Columbia, and 3 US territories. With assistance from the Centers for Disease Control and Prevention state health departments, telephone interviews using both cellphones and landlines are conducted continuously throughout the year. BRFSS uses random digit dialing techniques. BRFSS methodology has been described in detail elsewhere.⁴⁰ In 2014, the Centers for Disease Control and Prevention provided an optional sexual orientation module that, in addition to the US territory of Guam, was used by 19 states in 2014 and 25 states in 2016. Cellphone response rates for the BRFSS in 2014 and 2016 were 48.7% and 47.7%, respectively. Landline response rates for the BRFSS in 2014 and 2016 were 40.5% and 46.4%, respectively. This is consistent with recent BRFSS surveys and other national population-based surveys.^{41,42}

Inclusion criteria

All participants with complete data for sexual identity, race/ethnicity, and sleep duration questions were included in our analyses.

Exclusion criteria

We excluded participants who refused ($n = 6010$) to answer the sexual identity item. Because of sample size constraints, we also excluded participants who responded “don’t know/not sure” ($n = 3358$) or described their sexual identity as other ($n = 1364$). Approximately 2% ($n = 16,605$) of participants responded “don’t know” or refused to provide their race/ethnicity. These participants were excluded from analyses. An additional 3285 participants were excluded because of missing data for sleep duration.

Measures

Sexual identity

Sexual identity was assessed using a question that asked: “Do you consider yourself to be: 1) straight; 2) gay or lesbian; 3) bisexual; or 4) other?” Participants were classified as heterosexual, gay/lesbian, or bisexual and stratified by sex.

Race/ethnicity

Because of small sample sizes, participants who identified as “American Indian or Alaskan Native,” “other race,” and “multiracial” were combined into the category of “other race.” Therefore, race/ethnicity was coded as White, Black, Latino/a, Asian/Pacific Islander, and other race.

Sociodemographics

We assessed the following sociodemographic variables: age in years (18–24, 25–34, 35–44, 45–54, 55–64, over 65); sex (male, female); income level (less than \$15,000, \$15,000–\$24,999, \$25,000–\$34,999, \$35,000–\$49,999, and over \$50,000); education (less than high school, graduated high school, attended college or technical college, and graduated from college or technical college); marital status (married or living with partner, never married, and other); employment status (employed or self-employed, unemployed or not working, retired); and number of children in household.

Health behaviors

Health behaviors included current tobacco use (yes vs no), heavy drinking (>14 drinks per week for men; >7 drinks per week for women), and exercise, which was assessed by report of engaging in any recreational physical activity in the past 30 days (yes vs no).

Self-rated health

Perceived mental health was assessed with a measure of *poor mental health days* defined as number of days in the past 30 days in which mental health was not good. Likewise, for poor physical health days, participants were asked how many days in the past 30 days their physical health was not good. We dichotomized both measures (<14 days vs ≥14 days) based on established criteria.⁴³ We also assessed self-rated general health (excellent, very good, good, fair, or poor).

Health conditions

Participants were asked whether a health professional ever told them they had any of the following health conditions: depressive disorder (ie, depression, major depression, dysthymia, minor depression), heart attack, angina/coronary heart disease, stroke, arthritis (rheumatoid arthritis, gout, lupus, or fibromyalgia), asthma, diabetes, chronic obstructive pulmonary disease (including emphysema or chronic bronchitis), chronic kidney disease, and cancer (including skin cancer). Body mass index was calculated by using participants' self-reported height and weight. Participants with a body mass index ≥30 kg/m² were categorized as obese based on established criteria.⁴⁴ We then created a count measure for the number of health conditions reported (range 0–11).

Sleep duration

Sleep duration was measured by asking participants: "On average, how many hours of sleep do you get in a 24-hour period?" We categorized sleep as very short sleep (≤4 hours), short sleep (5–6 hours), adequate (7–8 hours), or long (≥9 hours) based on previous work.²⁷

Statistical analysis

Analyses were conducted in Stata, version 15, using survey weights to account for the complex sampling design of the BRFSS. All analyses were sex-stratified, and a *P* value < .05 was considered statistically significant. The Student *t* test and Rao-Scott χ^2 tests were used to examine sexual identity differences for continuous and categorical variables, respectively. Next, we estimated sex-stratified multinomial logistic regression models to examine differences in sleep duration (very short vs adequate, short vs adequate, long vs adequate) between sexual minority and heterosexual participants. We ran several models with differing levels of covariate adjustment. Model 1 adjusted for survey year and state of residence; model 2 added sociodemographics; and model 3 added measures of self-rated health, health behaviors, and health conditions. We then used fully adjusted sex- and race/ethnicity-stratified multinomial logistic regression models (model 3) to compare sleep duration in sexual minorities to heterosexual participants of the same race/ethnicity. Lastly, fully adjusted sex- and sexual identity-stratified multinomial logistic regression models (model 3) were used to compare sleep duration in racial/ethnic minorities to White participants who reported the same sexual identity.

Results

The final analytic sample consisted of 267,906 participants. Table 1 presents descriptive statistics for the 120,354 male participants of which 116,369 (96.2%) were heterosexual, 2463 (2.3%) were gay, and 1522 (1.5%) were bisexual. We compared all groups

of sexual minority men (SMM) to heterosexual men, regardless of race/ethnicity. Gay and bisexual men were more likely to be younger, have lower income, have never married, be unemployed or not working, and have fewer children in the household than heterosexual men. Compared to their heterosexual counterparts, gay men had higher educational attainment (*P* < .001), whereas bisexual men (*P* < .001) were less likely to be White. Both gay (*P* < .001) and bisexual (*P* = .04) men had higher rates of current tobacco use. Bisexual men reported a significantly higher mean number of chronic conditions (1.5 vs 1.2, *P* < .001) and were more likely to rate their general health as poor (*P* = .02) compared to heterosexual men. Compared to heterosexual men, bisexual men had higher rates of very short (*P* = .01) and long (*P* < .01) sleep duration.

Table 2 presents descriptive statistics for the 147,552 female participants of which 143,355 (96.1%) were heterosexual, 1694 (1.4%) were lesbian, and 2503 (2.5%) were bisexual. We compared all groups of SMW to heterosexual women, regardless of race/ethnicity. Lesbian and bisexual women were more likely to be younger (*P* < .001) and never married (*P* < .001) than heterosexual women. Compared to heterosexual women, lesbian women reported higher educational attainment (*P* = .02) and were more likely to be employed (*P* = .02), whereas bisexual women reported lower levels of education (*P* < .01), higher rates of unemployment (*P* < .001), and lower income levels (*P* < .001). Bisexual women were also more likely to identify as other race (*P* < .001) and had more children in the household (*P* = .02) than heterosexual women. Lesbian (*P* = .03) and bisexual (*P* < .001) women reported significantly higher rates of poor mental health days. In addition, bisexual women were more likely to rate their general health as poor relative to heterosexual women (*P* < .001). For health behaviors, lesbian and bisexual women reported significantly higher rates of current tobacco use and heavy drinking than heterosexual women. However, they were more likely to report exercising in the past month. Lastly, lesbian (1.6 vs 1.4, *P* = .03) and bisexual (1.6 vs 1.4, *P* < .001) women had a higher mean number of chronic conditions than heterosexual women. In terms of sleep duration, lesbian and bisexual women were more likely to report higher rates of very short and short sleep duration relative to heterosexual women.

Table 3 presents findings for sex-stratified multinomial logistic regression models examining the association of sexual identity and sleep duration. No sexual identity differences in sleep duration were identified for men. Lesbian (adjusted odds ratio [AOR] 1.85 [95% confidence interval [CI] = 1.01–3.40]) and bisexual (AOR 1.53 [95% CI = 1.15–2.04]) women had significantly higher odds of very short sleep duration compared to heterosexual women in fully adjusted models.

Results for fully adjusted sex- and race/ethnicity-stratified multinomial logistic regression analyses are shown in Table 4. Sexual minorities were compared to heterosexual participants of the same sex and race/ethnicity. Black gay men had higher rates of very short sleep relative to Black heterosexual men (AOR 2.35 [95% CI = 1.01–5.47]) but lower rates of long sleep (AOR 0.36 [95% CI = 0.15–0.91]). Latino (AOR 2.05 [95% CI = 1.06–3.97]) and Asian/Pacific Islander bisexual men (AOR 2.28 [95% CI = 1.01–5.16]) had higher odds of short sleep than their heterosexual counterparts of the same race/ethnicity. Asian/Pacific Islander (AOR 4.25 [95% CI = 1.36–13.25]) and other-race (AOR 3.87 [95% CI = 1.26–11.90]) bisexual men were also more likely to report long sleep compared to heterosexual men of the same race/ethnicity.

Fewer differences were observed between SMW and their same-race/-ethnicity heterosexual peers. Black lesbian (AOR 2.99 [95% CI = 1.21–7.42]) and bisexual women who identified as other race (AOR 3.62 [95% CI = 1.49–8.76]) had higher rates of very short sleep compared to heterosexual women of the same race/ethnicity. Compared to Black heterosexual women, Black lesbian women also had higher rates of long sleep (AOR 2.71 [95% CI = 1.09–6.71]).

Table 1
Sexual identity differences for sociodemographic characteristics, sleep duration, perceived health, and health conditions among men, BRFSS 2014; and 2016 (N = 120,354)

	Heterosexual (n = 116,369)	Gay (n = 2463)	Heterosexual vs gay P value	Bisexual (n = 1522)	Heterosexual vs bisexual P value
	Mean/%	Mean/%		Mean/%	
Sociodemographics					
Age			<.001		<.001
18–24	10.9	15.6		21.8	
25–34	16.8	21.4		22.6	
35–44	17.0	14.0		13.6	
45–54	18.8	23.2		14.6	
55–64	18.1	16.1		13.9	
≥65	18.4	9.7		13.5	
Race/ethnicity			.64		<.001
White	69.2	69.8		61.6	
Black	10.0	9.1		13.5	
Latino	13.0	12.0		13.2	
Asian/Pacific Islander	5.3	6.5		6.9	
Other race	2.4	2.6		4.8	
Income			.002		<.001
<\$15,000	7.5	10.8		14.7	
\$15,000–\$24,999	13.8	13.9		17.7	
\$25,000–\$34,999	9.7	6.3		14.7	
\$35,000–\$49,999	14.2	15.9		14.6	
>\$50,000	54.8	53.1		38.3	
Education			<.001		.13
Did not graduate high school	12.0	6.5		14.3	
Graduated high school	30.4	21.2		30.3	
Attended college or technical college	29.8	31.0		32.2	
Graduated college or technical college	27.8	41.3		23.2	
Relationship status			<.001		<.001
Married/partnered	61.5	32.3		37.7	
Other	15.3	8.1		15.0	
Never married	23.2	59.6		47.3	
Employment status			<.001		<.001
Employed or self-employed	67.7	67.0		57.5	
Unemployed or not working	14.8	21.4		28.8	
Retired	17.5	11.6		13.7	
Mean number of children in household	0.6	0.2	<.001	0.5	.03
Perceived health					
Poor mental health days	8.6	14.3	<.001	17.2	<.001
Poor physical health days	10.3	9.3	.37	12.9	.08
General health			.31		.02
Excellent	19.5	21.1		16.4	
Very good	33.7	34.9		32.4	
Good	31.4	31.3		30.2	
Fair	11.6	9.6		15.0	
Poor	3.8	3.1		6.0	
Health behaviors					
Current tobacco use	18.7	25.5	<.001	22.3	.04
Heavy drinking	7.0	8.5	.09	8.5	.24
Exercise in the past month	79.3	81.5	.16	78.8	.77
Health conditions					
Mean number of chronic conditions	1.2	1.1	.28	1.5	<.001
Sleep duration					
Very short sleep	4.0	5.5	.13	6.5	<.001
Short sleep	31.7	30.0		34.2	
Adequate sleep	57.8	56.8		48.9	
Long sleep	6.5	7.7		10.4	

Boldface denotes statistical significance defined as $P < .05$. Reference group = heterosexual men.

Results for fully adjusted sex- and sexual identity-stratified multinomial logistic regression analyses are shown in Table 5. Black heterosexual men and women reported higher rates of all forms of inadequate sleep duration compared to their White counterparts. Asian/Pacific Islander heterosexual men had higher rates of short sleep (AOR 1.20 [95% CI = 1.03–1.38]), whereas other-race heterosexual men reported higher rates of very short (AOR 1.78 [95% CI = 1.37–2.31]) and short sleep (AOR 1.30 [95% CI = 1.14–1.49]) than their White peers. Among heterosexual women, both Asian/Pacific Islander and other-race women had higher rates of very short and short sleep relative to White women. Latina heterosexual

women reported lower rates of very short sleep (AOR 0.74 [95% CI = 0.59–0.94]) than their White counterparts. Black (AOR 6.07 [95% CI = 2.34–15.73]) and Latino (AOR 4.61 [95% CI = 2.54–13.76]) gay men reported higher rates of very short sleep compared to White gay men, whereas Asian/Pacific Islander (AOR 3.04 [95% CI = 1.25–7.41]) and other-race (AOR 1.96 [95% CI = 1.02–3.80]) gay men reported higher rates of short sleep. Among bisexual men, only Asian/Pacific Islanders had higher rates of short sleep than Whites (AOR 2.76 [95% CI = 1.13–6.77]). Fewer differences in sleep duration were identified among women. Only other-race lesbian women reported lower rates of long sleep than White lesbian

Table 2

Sexual identity differences for demographic characteristics, sleep duration, perceived health, and health conditions among women, BRFSS 2014; and 2016 (N = 147,552)

	Heterosexual (n = 143,355)	Lesbian (n = 1694)	Heterosexual vs lesbian	Bisexual (n = 2503)	Heterosexual vs bisexual
	Mean/%	Mean/%	P value	Mean/%	P value
Sociodemographics					
Age			<.001		<.001
18–24	9.8	17.7		32.7	
25–34	15.1	19.9		30.3	
35–44	16.9	17.4		15.0	
45–54	18.9	21.2		10.2	
55–64	18.5	12.9		6.0	
≥ 65	20.8	10.9		5.8	
Race/ethnicity			.19		<.001
White	68.7	61.8		64.3	
Black	12.1	12.4		12.8	
Latina	11.9	15.2		14.4	
Asian/Pacific Islander	5.1	6.6		3.9	
Other race	2.2	4.0		4.6	
Income			.55		<.001
<\$15,000	10.9	12.9		17.2	
\$15,000–\$24,999	16.8	16.2		25.2	
\$25,000–\$34,999	10.7	8.6		11.0	
\$35,000–\$49,999	13.8	12.9		14.0	
>\$50,000	47.8	49.4		32.6	
Education			.02		.002
Did not graduate high school	10.1	9.0		12.6	
Graduated high school	27.0	18.9		25.5	
Attended college or technical college	33.6	38.1		38.2	
Graduated college or technical college	29.3	34.0		23.7	
Relationship status			<.001		<.001
Married/partnered	56.2	41.6		36.9	
Other	24.3	14.5		17.7	
Never married	19.5	43.9		45.4	
Employment status			.02		<.001
Employed or self-employed	54.3	62.5		58.3	
Unemployed or not working	27.5	26.3		37.2	
Retired	18.2	11.2		4.5	
Mean number of children in household	0.8	0.5	<.001	0.9	.02
Perceived health					
Poor mental health days	12.4	16.0	.03	32.3	<.001
Poor physical health days	12.2	14.1	.42	14.5	.06
General health			.18		<.001
Excellent	19.0	14.8		13.8	
Very good	34.5	34.8		30.5	
Good	30.2	35.4		34.1	
Fair	12.2	12.0		16.9	
Poor	4.1	3.0		4.8	
Health behaviors					
Current tobacco use	15.2	25.1	<.001	28.2	<.001
Heavy drinking	6.0	13.9	<.001	14.6	<.001
Exercise in the past month	75.9	82.8	<.001	79.9	.01
Health conditions					
Mean number of chronic conditions	1.4	1.6	.03	1.6	<.001
Sleep duration					
Very short sleep	3.7	6.8	<.01	7.6	<.001
Short sleep	30.5	36.5		37.1	
Adequate sleep	58.4	49.9		47.1	
Long sleep	7.3	6.8		8.2	

Boldface denotes statistical significance defined as $P < .05$. Reference group = heterosexual women.

women (AOR 0.14 [95% CI = 0.03–0.77]). Black bisexual women reported higher rates of short sleep than White bisexual women (AOR 1.82 [95% CI = 1.03–3.21]).

Discussion

This is the largest and one of the few studies to examine sleep duration among sexual minorities. Additionally, these data are an important contribution to understanding the multiplicative effect of sexual minority and racial/ethnic minority identities on sleep duration. Initial multivariable analyses identified higher rates of very short sleep in lesbian and bisexual women, whereas no significant

sexual identity differences were noted for men. Several studies have detected no sexual identity differences in sleep duration among US adults.^{22–24} These 3 studies analyzed the same data set, the National Health Interview Survey, and may have lacked statistical power to detect sexual identity differences. We were unable to compare our findings to those of Chen and Shiu²² because they compared all sexual minority groups, regardless of sex, to heterosexual men. Three additional studies have identified higher rates of inadequate sleep duration in bisexual men,^{25,45} bisexual women,²⁶ and “mostly lesbian” women compared to their heterosexual counterparts.²⁵ With the exception of the study by Caceres and Hickey,²⁶ the remaining studies did not adjust analyses for health-related variables, which

Table 3

Results of multivariable analyses examining sexual identity differences in sleep duration in men and women, BRFSS 2014; and 2016 (N = 267,906)

	Men			Women		
	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)
Very short sleep duration						
Gay/lesbian	1.43 (0.98-2.07)	1.52 (1.05-2.21)	1.22 (0.83-1.78)	2.17 (1.26-3.73)	2.32 (1.30-4.14)	1.85 (1.01-3.40)
Bisexual	1.91 (1.30-2.81)	1.52 (1.03-2.25)	1.21 (0.82-1.79)	2.55 (1.94-3.36)	2.16 (1.62-2.88)	1.53 (1.15-2.04)
Short sleep duration						
Gay/lesbian	0.97 (0.80-1.16)	0.99 (0.82-1.19)	0.93 (0.77-1.13)	1.40 (1.07-1.83)	1.35 (1.04-1.77)	1.22 (0.94-1.59)
Bisexual	1.28 (1.04-1.58)	1.22 (0.99-1.50)	1.13 (0.92-1.40)	1.51 (1.28-1.78)	1.33 (1.13-1.59)	1.11 (0.94-1.32)
Long sleep duration						
Gay/lesbian	1.19 (0.92-1.55)	1.12 (0.85-1.48)	1.07 (0.82-1.41)	1.07 (0.75-1.53)	1.13 (0.80-1.61)	1.06 (0.74-1.51)
Bisexual	1.90 (1.34-2.70)	1.50 (1.05-2.15)	1.40 (0.98-2.00)	1.37 (1.07-1.76)	1.29 (0.99-1.68)	1.14 (0.87-1.48)

Boldface denotes statistical significance defined as $P < .05$. Reference group = heterosexual participants of same sex.

Model 1 = adjusted for year and state of residence.

Model 2 = added race/ethnicity and other sociodemographics.

Model 3 = added perceived health, health behaviors, and health conditions.

are particularly important because the initial differences in sleep duration we observed for bisexual men and SMW in bivariate analyses were attenuated when self-rated health, health behaviors, and health conditions were added to regression models.

A major strength of our study is that we incorporated an intersectional approach to assess sleep duration in sexual minorities. First, we examined sleep duration in sexual minorities compared to heterosexual participants of the same race/ethnicity. We found lower rates of short and long sleep among Asian/Pacific Islander bisexual men compared to heterosexual same-race/-ethnicity peers. This finding has not been reported in previous studies and warrants further investigation into factors that may explain this difference. Black gay men and Latino, Asian/Pacific Islander, and other-race bisexual men had higher rates of inadequate sleep duration than heterosexual men of the same race/ethnicity. Surprisingly, few differences were observed among SMW of color. When compared to same-race/-ethnicity heterosexual women, only Black lesbian women and other-race bisexual women had higher rates of inadequate sleep duration.

Next, we compared sleep duration in racial/ethnic minorities to White peers who reported the same sexual identity. We found higher rates of inadequate sleep duration among Black, Asian/Pacific

Islander, and other-race heterosexual participants. This is consistent with evidence from population-based studies.^{29–31,46} It is important to note that findings from those studies may have combined heterosexual and sexual minority participants, as racial/ethnic differences in sleep duration were examined without accounting for sexual identity. In addition, we found that Latina heterosexual women had lower rates of very short sleep than White heterosexual women. With the exception of the higher rates of very short sleep reported by Latino gay men, few differences in sleep duration were found among Latino sexual minorities. Given previous evidence of heterogeneity in sleep duration among Latinos based on sociocultural factors,^{30,33,34} more research is needed to examine how these factors influence sleep duration in both heterosexual and sexual minority people of color.

Our findings suggest that SMM of color experience higher rates of inadequate sleep duration than White SMM. Both Black and Latino gay men reported higher rates of very short sleep than White gay men. Similarly, compared to White men of the same sexual identity, Asian/Pacific Islander gay and bisexual men and other-race gay men reported higher rates of short sleep. Fewer differences in sleep duration were observed between SMW of color and their heterosexual

Table 4

Results of multivariable analyses examining differences in sleep duration comparing sexual minority men and women to same-race/-ethnicity heterosexuals, BRFSS 2014; and 2016 (N = 267,906)

	Men			Women		
	Very short sleep vs adequate AOR (95% CI)	Short sleep vs adequate AOR (95% CI)	Long sleep vs adequate AOR (95% CI)	Very short sleep vs adequate AOR (95% CI)	Short sleep vs adequate AOR (95% CI)	Long sleep vs adequate AOR (95% CI)
White						
Gay/lesbian	0.74 (0.50-1.10)	0.86 (0.70-1.06)	1.30 (0.95-1.77)	2.13 (0.85-5.34)	1.10 (0.86-1.39)	0.91 (0.62-1.33)
Bisexual	1.17 (0.72-1.93)	0.94 (0.73-1.22)	1.36 (0.87-2.13)	1.24 (0.87-1.76)	1.08 (0.88-1.34)	1.06 (0.80-1.39)
Black						
Gay/lesbian	2.35 (1.01-5.47)	0.63 (0.35-1.15)	0.36 (0.15-0.91)	2.99 (1.21-7.42)	1.19 (0.64-2.20)	2.71 (1.09-6.71)
Bisexual	0.95 (0.29-3.10)	0.89 (0.50-1.58)	0.31 (0.09-1.03)	1.46 (0.71-3.03)	1.27 (0.75-2.16)	1.00 (0.46-2.17)
Latino/a						
Gay/lesbian	2.28 (0.83-6.31)	1.23 (0.72-2.09)	0.88 (0.37-2.08)	1.44 (0.44-4.68)	1.47 (0.63-3.42)	1.08 (0.35-3.31)
Bisexual	1.38 (0.55-3.44)	2.05 (1.06-3.97)	1.25 (0.40-3.95)	1.95 (0.70-5.37)	1.45 (0.86-2.44)	1.26 (0.52-3.08)
Asian/Pacific Islander						
Gay/lesbian	0.04 (0.01-0.26)	2.16 (0.85-5.52)	0.20 (0.05-0.83)	0.15 (0.02-1.13)	1.75 (0.39-7.78)	1.10 (0.17-7.43)
Bisexual	2.23 (0.67-7.47)	2.28 (1.01-5.16)	4.25 (1.36-13.25)	4.12 (0.86-19.84)	0.57 (0.18-1.83)	2.67 (0.69-10.31)
Other race						
Gay/lesbian	0.85 (0.29-2.52)	1.09 (0.58-2.04)	1.46 (0.44-4.82)	1.39 (0.18-10.87)	1.86 (0.83-4.19)	0.29 (0.07-1.18)
Bisexual	0.64 (0.20-2.12)	1.20 (0.44-3.25)	3.87 (1.26-11.90)	3.62 (1.49-8.76)	0.77 (0.41-1.44)	1.04 (0.37-2.88)

Boldface denotes statistical significance defined as $P < .05$. Reference group = heterosexual participants of same sex and race/ethnicity.

All models were adjusted for year, state of residence, sociodemographics, perceived health, health behaviors, and health conditions.

Table 5

Results of multivariable analyses examining differences in comparing racial/ethnic minorities to White participants of the same sexual identity, BRFSS 2014; and 2016 (N = 267,906)

	Men			Women		
	Very short sleep vs adequate AOR (95% CI)	Short sleep vs adequate AOR (95% CI)	Long sleep vs adequate AOR (95% CI)	Very short sleep vs adequate AOR (95% CI)	Short sleep vs adequate AOR (95% CI)	Long sleep vs adequate AOR (95% CI)
Heterosexual						
Black	2.11 (1.75-2.56)	1.77 (1.61-1.94)	1.53 (1.31-1.77)	1.87 (1.57-2.24)	1.59 (1.47-1.73)	1.31 (1.14-1.49)
Latino/a	0.81 (0.63-1.03)	0.93 (0.84-1.03)	1.16 (0.94-1.43)	0.74 (0.59-0.94)	1.04 (0.94-1.15)	1.11 (0.91-1.34)
Asian/Pacific Islander	1.40 (0.96-2.03)	1.20 (1.03-1.38)	0.93 (0.68-1.26)	2.24 (1.37-3.64)	1.71 (1.46-2.01)	0.62 (0.43-0.90)
Other race	1.78 (1.37-2.31)	1.30 (1.14-1.49)	1.25 (0.97-1.62)	1.44 (1.13-1.85)	1.35 (1.16-1.58)	1.13 (0.89-1.43)
Gay/lesbian						
Black	6.07 (2.34-15.73)	1.53 (0.78-3.00)	0.42 (0.15-1.16)	2.86 (0.75-10.82)	1.89 (0.98-3.63)	2.59 (0.89-7.50)
Latino/a	4.61 (1.54-13.76)	1.59 (0.91-2.76)	0.94 (0.37-2.38)	0.57 (0.11-2.85)	1.73 (0.77-3.84)	0.70 (0.24-2.08)
Asian/Pacific Islander	0.14 (0.02-0.93)	3.04 (1.25-7.41)	0.16 (0.03-0.74)	0.15 (0.02-1.15)	3.03 (0.79-11.65)	0.42 (0.06-2.74)
Other race	2.54 (0.74-8.78)	1.96 (1.02-3.80)	1.93 (0.59-6.42)	1.05 (0.09-12.82)	2.03 (0.90-4.59)	0.14 (0.03-0.77)
Bisexual						
Black	1.89 (0.63-5.65)	1.56 (0.84-2.90)	0.36 (0.11-1.25)	2.08 (0.87-4.94)	1.82 (1.03-3.21)	1.19 (0.51-2.77)
Latino/a	2.04 (0.68-6.08)	1.91 (0.96-3.80)	1.10 (0.33-3.69)	1.62 (0.64-4.12)	1.41 (0.81-2.46)	1.55 (0.74-3.22)
Asian/Pacific Islander	1.69 (0.48-5.99)	2.76 (1.13-6.77)	2.97 (0.99-8.92)	3.54 (0.80-15.55)	0.86 (0.27-2.83)	2.27 (0.48-10.76)
Other race	1.01 (0.27-3.77)	1.66 (0.70-4.00)	3.75 (0.81-15.36)	2.47 (0.89-6.85)	0.93 (0.48-1.80)	0.98 (0.38-2.55)

Boldface denotes statistical significance defined as $P < .05$. Reference group = White participants of same sex and sexual identity.

All models were adjusted for year, state of residence, sociodemographics, perceived health, health behaviors, and health conditions.

counterparts. Other-race lesbian women reported lower rates of long sleep than White lesbian women. Black bisexual women had higher rates of short sleep than White bisexual women. To our knowledge, this is the first study to examine racial/ethnic differences in sleep duration within sexual identity categories. Therefore, future work is needed to assess whether these differences in sleep duration observed in sexual minorities of color, particularly men and Black bisexual women, are present in other samples.

Although our findings describe higher inadequate sleep duration among sexual minorities of color, particularly men, reasons for these observed disparities are unclear. There is conflicting evidence whether the lower rates of some health risk behaviors (eg, smoking and alcohol use)⁴⁷ observed among racial/ethnic minorities in the general population hold true for sexual minorities of color.⁴⁸⁻⁵⁰ Our findings suggest that there is excess risk for inadequate sleep duration among SMM of color and Black SMW. We posit that exposure to minority stressors (eg, victimization, discrimination, and internalized homophobia)³⁹ might explain some of these disparities. To date, no study has examined associations between minority stressors and sleep duration in sexual minorities. A recent systematic review identified that different forms of discrimination (eg, racial/ethnic, sex, and immigration status) were associated with poor sleep outcomes.³⁸ Given that discrimination is associated with poor sleep health in other marginalized populations,^{33,38} it is likely that experiencing multiple forms of minority stress might negatively impact sleep health among sexual minorities. This is an important area that warrants further research. Also, it is possible that, in addition to experiencing discrimination on the basis of race/ethnicity and sexual identity, bisexual racial/ethnic minorities might also experience bisexual stigma⁵¹ that might confer excess risk for inadequate sleep duration. Previous studies suggest that, compared to heterosexual peers, bisexuals have higher rates of poor mental health and risk behaviors,⁵²⁻⁵⁴ which have been linked to inadequate sleep duration.

Our findings add to the growing evidence documenting inadequate sleep duration among sexual minorities, which might contribute to deleterious health effects. Implications for clinicians include the importance of incorporating assessments and education regarding sleep health in clinical practice with sexual minorities. Clinical and public health interventions aimed at reducing factors that impair

sleep health among sexual minorities, particularly those with multiple marginalized statuses, should be created and disseminated for broad adoption. Recently, there has been concern regarding the possible omission of sexual orientation (eg, identity, behavior, and attraction) from several national surveys in the United States. The differences in sleep duration we observed in sexual minorities, particularly racial/ethnic minorities, highlight the importance of continued inclusion of sexual orientation items in population-based surveys.

Limitations

A significant limitation of this work is that BRFSS includes a single measure of sleep duration with no specified time frame, which may have not fully captured sleep health. Several studies have examined sexual identity differences using more comprehensive dimensions of sleep health. These studies found that SMW were more likely to report trouble falling asleep and staying asleep throughout the night.^{22,24,25} Galinsky et al²⁴ also found that gay men were more likely to report trouble falling asleep, use medications to sleep, and wake up not feeling rested. BRFSS consists of cross-sectional data, so we cannot infer causality from these findings. Given the strong association between inadequate sleep and negative health outcomes, future studies should prospectively examine these associations in sexual minorities as well as potential mediators (eg, poor mental health and health risk behaviors) of the association between sexual identity and sleep duration. There is also a need to examine whether the observed associations remain using objective sleep data, such as actigraphy or polysomnography.

Furthermore, because only sexual identity is measured in the BRFSS, other classifications of sexual orientation were omitted from the present study. Also, given sample size constraints due to the limited number of racial/ethnic minorities that reported their sexual identity as “don’t know/not sure,” we excluded this group. However, previous research indicates that individuals who are unsure of their sexual identity may experience higher rates of violence,^{55,56} poor mental health,⁵³ and substance use^{57,58} compared to their heterosexual counterparts. Future studies should examine whether the disparities in sleep duration observed in sexual minorities of color are also present in people of color who identify as “don’t know/not sure.”

Similarly, future work should include additional dimensions of sexual orientation (including sexual behavior and attraction) to examine their associations with sleep duration. Because the BRFSS does not include measures of minority stress, additional research is needed to examine the associations between minority stressors as risk factors for inadequate sleep in sexual minorities.

Conclusion

Inadequate sleep duration has emerged as a significant risk factor for chronic disease and premature mortality. In the present study, we found that SMW were more likely to report very short sleep compared to heterosexual women, regardless of race/ethnicity. Racial/ethnic minority SMM, particularly bisexual individuals, and Black SMW demonstrated higher rates of inadequate sleep than their heterosexual peers of the same race/ethnicity and White participants who reported the same sexual identity. Additional research examining the multiplicative effect of sexual identity and race/ethnicity on sleep duration is needed to better understand how to promote sleep health among sexual minorities, particularly racial/ethnic minorities, and to assess the impact of inadequate sleep on health outcomes in this population.

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