

## E-cigarette Use and Risk Behaviors among Lesbian, Gay, Bisexual, and Transgender Adults: The Behavioral Risk Factor Surveillance System (BRFSS) Survey

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Received July 8, 2020; Accepted for publication Sept. 14, 2020; Published online Dec. 11, 2020  
<https://doi.org/10.17161/kjm.voll3.i3861>

### ABSTRACT

**Introduction.** The prevalence of e-cigarette use among lesbian, gay, bisexual, and transgender (LGBT) individuals and its association with risk behaviors was studied.

**Methods.** Using data from the Behavioral Risk Factor Surveillance System (BRFSS) survey, self-reported sexual orientation, e-cigarette use, cigarettes, marijuana, smokeless tobacco, and high-risk behavior (using non-prescribed drugs, treatment for sexually transmitted disease, or receiving monetary or drug compensation in exchange for sex in the previous year) were assessed. Multivariable-adjusted logistic regression models were used to study the association between LGBT and risk behaviors.

**Results.** The prevalence of e-cigarette use among LGBT adults was 13%, nearly twice that of heterosexual adults. LGBT adults were more likely [Odds Ratio (95% Confidence Interval)] to report current use of e-cigarettes 1.84 (1.64, 2.06), cigarettes 1.61 (1.49, 1.73), marijuana 2.37 (1.99, 2.82), and high-risk behavior 3.69 (3.40, 4.01) compared to heterosexual adults. Results for smokeless tobacco were not significant.

**Conclusion.** There are disparities in e-cigarette and other risk behaviors among LGBT adults, which may increase risk of adverse health effects in this vulnerable population. *Kans J Med* 2020;13:318-321

### INTRODUCTION

The past few decades have witnessed an overall decline in tobacco

the dangers of cigarette smoking and the health benefits of smoking cessation. On the other hand, there has been an increase in e-cigarette use and other vaping-related products. This likely is related, in part, to marketing strategies advertising e-cigarettes as safer alternatives to conventional tobacco products, often targeting vulnerable populations. The increase in e-cigarette consumption has been linked to serious cardiopulmonary health effects,<sup>1-6</sup> though there are no epidemiologic data to support a higher risk of long-term events with these products.

Cigarette smoking is higher among LGBT (lesbian, gay, bisexual, and transgender) populations compared with heterosexual adults.<sup>7</sup> LGBT represent a minority group in the U.S., and this population has been shown to have a disproportionately higher risk of adverse outcomes.<sup>8</sup> These disparities could be explained by risk behaviors that may be more prevalent among sexual minority groups compared to the general population.<sup>9,10</sup> This underscores the importance of screening for such behaviors and to develop interventions to mitigate possible health effects.

The present study investigated the association between sexual orientation and risk behaviors including tobacco use patterns (cigarette, e-cigarette, smokeless tobacco), marijuana, and high-risk sexual behaviors in a nationally representative U.S. sample. Stratified analyses were performed by age and gender to determine whether certain subgroups of the LGBT population may be particularly at high risk of such risk behaviors. Lastly, temporal trends in the prevalence of these behaviors were evaluated.

### METHODS

**Study Population and Study Design.** The Behavioral Risk Factor Surveillance System (BRFSS) survey is established by the Centers for Disease Control and Prevention. It is a nationwide telephone-based questionnaire that is administered to a random sample of U.S. adult residents. The BRFSS survey aims to evaluate health-related risk behaviors, chronic health conditions, and the use of preventive services in a representative sample of U.S. adults. The survey is conducted in all 50 states, the District of Columbia, and the three U.S. territories. This makes BRFSS the largest telephone-based survey in the world. Cross-sectional data from BRFSS surveys conducted in 2016, 2017, and 2018 (n = 1,348,091) were utilized. The 2018 dataset included participants interviewed in the year 2019, therefore, trends up until year 2019 were evaluated. Given that BRFSS is a publicly available dataset, these analyses did not require Institutional Review Board approval.

**Definition of LGBT.** Complete information on LGBT status was available for 510,398 participants. LGBT status was self-reported and defined as participants identifying themselves as being lesbian, gay, bisexual, or transgender. Participants answering “Yes” to the question, “Do you consider yourself to be straight?”, were classified as heterosexual.

**Definition of Risk Behaviors.** E-cigarette status was ascertained if participants reported ever using e-cigarette or other electronic vaping products. Current users were defined as participants reporting currently using these products every day or some days. Cigarette smokers were identified as participants who reported having smoked

at least 100 cigarettes in their lifetime. Ever smokers were classified as current or former depending on whether they currently smoked cigarettes every day or some days. Smokeless tobacco use was classified as participants reporting yes to the questions assessing current use of chewing tobacco, snuff, or snus every day or some days. Marijuana use was classified as participants reporting use of marijuana or hashish at least one day in the previous 30 days. High-risk behavior was defined if participants reported ever using non-prescribed drugs, were treated for sexually transmitted disease, or if they received monetary or drug compensation in exchange for sex in the previous year.

**Statistical Analysis.** BRFSS data were analyzed using survey weights as BRFSS employed design weighting and iterative proportional fitting to ensure adequate representation of the general U.S. population. The association between sexual orientation (LGBT vs. heterosexual) and risk behaviors was studied using weighted multivariable logistic regression models. Covariates adjusted for in this analysis included age, poverty level, education, race/ethnicity, marital status, and employment status. Results were stratified by age groups and gender.

Similar multivariable-adjusted logistic regression models were used to study the association between current e-cigarette use and other risk behaviors among LGBT subjects. Lastly, prevalence of these risk behaviors was examined between 2016 and 2019 and tested for significance using Pearson  $\chi^2$  statistic.

Analyses were conducted using Stata version 13.1 (StataCorp, College Station, Texas). All p-values were two-sided and  $p < 0.05$  was considered statistically significant.

## RESULTS

Among 510,398 participants, 4.8% ( $n = 20,011$ ) reported being LGBT (53% were aged 18 - 34 years, 38% were men, 60% were White, 13% were Black, and 17% were Hispanic). Among LGBT subjects, the prevalence of current e-cigarette use was 13.0% (95% CI; 12.0%, 14.2%) versus 4.8% (4.6%, 4.9%) among heterosexuals. Other risk behaviors were also higher among LGBT subjects compared to heterosexuals (Table 1).

**LGBT and Risk Behaviors.** In multivariable-adjusted analyses, LGBT adults as compared to heterosexuals had higher odds (Odds Ratio (95% Confidence Interval)) of currently using e-cigarettes: 1.84 (1.64, 2.06), cigarettes: 1.61 (1.49, 1.73), as well as dual use of these products: 1.69 (1.47, 1.94). LGBT adults also had higher odds of using marijuana: 2.37 (1.99, 2.82) and engaging in high-risk behavior: 3.69 (3.40, 4.01). There was no significant association between LGBT and smokeless tobacco use (Table 2). Similar results were obtained in analyses stratified by age and gender (results not shown).

**Current E-cigarette Use and Risk Behaviors among LGBT Subjects.** Current e-cigarette use among LGBT subjects was significantly associated with higher odds of current cigarette smoking: 8.71 (6.82, 11.13), smokeless tobacco use: 2.51 (1.37, 4.59), and marijuana use: 6.02 (3.65, 9.94).

**Temporal Trends in Risk Behaviors.** In trend analyses, there was a significantly increasing prevalence of current e-cigarette use, current cigarette use, and high-risk behavior among LGBT subjects between the years 2016 and 2019 (Figure 1).

**Table 1. Baseline characteristics of the study population by sexual orientation.\***

	Heterosexual N = 490,387 (95%)	LGBT N = 20,011 (5%)
<b>Age (years)</b>		
18 - 34	66,715 (26)	7,206 (53)
35 - 44	54,521 (16)	2,699 (14)
45 - 54	78,112 (17)	3,146 (13)
55 - 64	110,332 (18)	3,487 (11)
≥ 65	180,707 (22)	3,653 (9)
<b>Gender</b>		
Men	162,742 (40)	7,269 (38)
Women	327,453 (60)	12,678 (62)
<b>Race/ethnicity</b>		
White	375,579 (64)	14,105 (60)
Black	40,186 (12)	1,667 (13)
Hispanic	31,705 (16)	1,895 (17)
Other	35,820 (8)	2,012 (10)
<b>Education</b>		
Less than high school	32,339 (13)	1,431 (13)
High school - some college	269,269 (60)	10,547 (61)
Greater than college	187,608 (28)	7,984 (26)
<b>Marital status</b>		
Married	253,888 (52)	5,896 (26)
Divorced/separated	80,639 (14)	2,921 (11)
Widowed	67,804 (8)	1,102 (3)
Single	85,694 (26)	9,975 (60)
<b>Employment status</b>		
Employed	236,472 (56)	11,095 (58)
Unemployed	84,461 (19)	4,070 (21)
Student	11,299 (5)	1,360 (11)
Retired	155,268 (20)	3,345 (9)
<b>Income</b>		
< \$50,000	210,761 (43)	10,001 (50)
≥ \$50,000	279,626 (57)	10,010 (50)
Current cigarette smoking status	69,132 (15)	4,571 (25)
<b>Current e-cigarette use</b>		
Every day	4,903 (34)	489 (32)
Some days	9,138 (66)	967 (68)
Dual e-cigarette and cigarette use	7,571 (2)	781 (4)
Smokeless tobacco use	12,474 (2.9)	540 (3.3)
Marijuana at least once per month	4,968 (8)	741 (25)
<b>High risk behavior</b>	14,646 (5)	3,626 (24)

\*Categorical variables are listed as counts (percentage).

**Table 2. Multivariable-adjusted<sup>a</sup> odds ratios (95% confidence interval) for the association of LGBT with risk behaviors.**

	Question asked	Health factor definition	Heterosexual	LGBT	
				Unadjusted	Adjusted
<b>Current e-cigarette use</b>	Have you ever used an e-cigarette or other electronic vaping product, even just one time, in your entire life?	Current e-cigarette use	1 (ref)	2.97 (2.68, 3.29)	1.84 (1.64, 2.06)
<b>Current cigarette use</b>	Do you now smoke cigarettes every day, some days, or not at all?	Current cigarette use	1 (ref)	1.83 (1.71, 1.95)	1.61 (1.49, 1.73)
<b>Dual e-cigarette and cigarette use</b>	There was no question specifically pertaining to dual use in BRFSS.	Dual use	1 (ref)	2.41 (2.12, 2.75)	1.69 (1.47, 1.94)
<b>Smokeless tobacco</b>	Do you currently use chewing tobacco, snuff, or snus every day, some days, or not at all?	Yes	1 (ref)	1.17 (0.97, 1.39)	0.96 (0.98, 1.15)
<b>Marijuana</b>	During the past 30 days, on how many days did you use marijuana or hashish?	Yes	1 (ref)	3.80 (3.23, 4.48)	2.37 (1.99, 2.82)
<b>High risk behavior</b>	Have you injected any drug other than those prescribed for you in the past year? Have you been treated for a sexually transmitted disease or STD in the past year? Have you been given or received money or drugs in exchange for sex in the past year?	Yes	1 (ref)	6.13 (5.70, 6.60)	3.69 (3.40, 4.01)

<sup>a</sup>Model is adjusted for age, race/ethnicity, poverty level, education, employment status, and marital status.

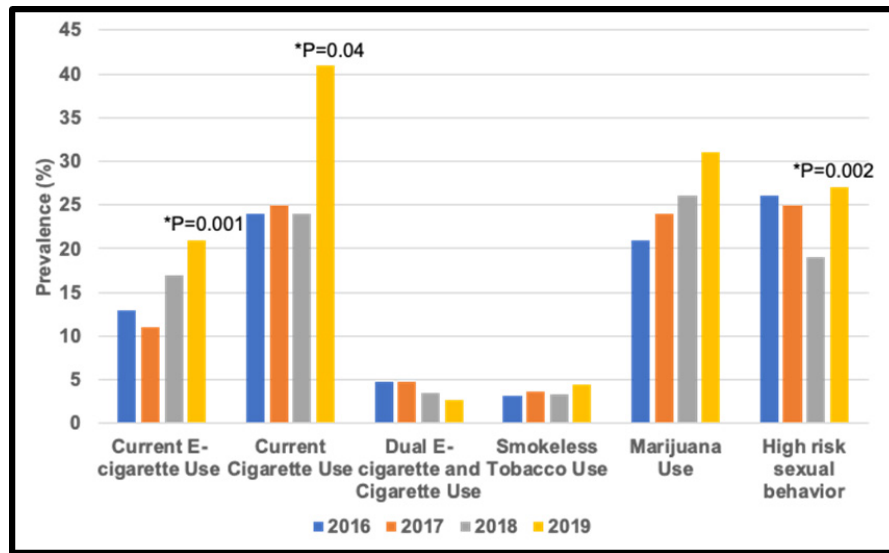


Figure 1. Trends in prevalence of risk behaviors among LGBT adults between the years 2016 and 2019.

## DISCUSSION

In a nationally representative U.S. sample, the prevalence of current e-cigarette use among LGBT adults is 13%, almost twice that of heterosexual adults. LGBT adults are more likely to report current use of e-cigarettes, cigarettes, and marijuana, as well as high-risk behaviors compared to heterosexual adults. These results are similar in all age groups and among men and women who are LGBT. Finally, there is a time trend with increasing e-cigarette use and regular cigarette smoking over time.

A prior analysis from the 2016 BRFSS data showed that transgender as compared to cisgender adults were not more likely to smoke cigarettes currently and ever use e-cigarettes after adjusting for demographic factors.<sup>11</sup> Our study used more recent data from the 2017 and 2018 BRFSS datasets, therefore, had higher statistical power to study the association between LGBT and risk behaviors given the increasing prevalence of e-cigarettes over time in the U.S.<sup>12</sup> and the larger sample size of adults.

Another study showed that LGBT adults were twice as likely to report current e-cigarette use compared to heterosexual adults.<sup>13</sup> Consistent with these prior reports, LGBT adults were nearly twice more likely to use e-cigarettes compared to heterosexuals in our analysis of a nationally representative cohort of U.S. adults. The higher likelihood of e-cigarette use and other risk behaviors among LGBT adults may be in part due to burden of mental illness<sup>14,15</sup> resulting from stigmatization and discrimination from family or society. A prior study also has shown that sexual identity disorder is associated with both cigarette smoking and e-cigarette use among high school students.<sup>16</sup> Our study did not include adults younger than 18 years old, though subgroup analyses by age showed that our results were broadly consistent across different age groups.

Concerted efforts are required to educate the LGBT community about the potential harms of e-cigarette use given misconceptions about their safety. This misconception is likely the result of marketing strategies that promote e-cigarettes as safer alternatives to smoking.<sup>17</sup> Dual use of e-cigarettes and cigarettes was higher among LGBT compared to heterosexual adults. Our results also showed that there is a higher likelihood of such behaviors with e-cigarette use. LGBT adults may be at a higher risk of adverse cardiovascular health consequences from both traditional smoking and e-cigarette use. Clinicians treating LGBT adults may need to screen specifically for e-cigarettes, in addition to other associated risk behaviors, and educate them regarding potential harms.

Since our variables were all self-reported, they are subject to misclassification. Reasons underlying risk behaviors could not be evaluated. While we adjusted for multiple covariates in the analysis, there remained the possibility of residual confounding.

In conclusion, there are disparities in e-cigarette and other risk behaviors among LGBT adults, which may increase the risk of adverse health effects in this vulnerable population.

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*Keywords: sexual and gender minorities, e-cigarettes, smoking, Behavioral Risk Factor Surveillance System*