



Research Paper

Cigarette, smokeless tobacco, and alcohol use among transgender adults in the United States

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ARTICLE INFO

Keywords:

Cigarette
Smokeless tobacco
Heavy drinking
Binge drinking
Transgender
Cisgender

ABSTRACT

Background: Research suggests that sexual minority adults face disparate risks for poor health outcomes. However, prior research on transgender populations has been limited by small and nonprobability samples and has potentially masked important differences between transgender subgroups. We examined disparities in cigarette, smokeless tobacco, and alcohol consumption by transgender and cisgender adults.

Methods: 2014–2017 Behavioral Risk Factor Surveillance System data were used. Multivariable logistic regressions examined differences in cigarette, smokeless tobacco, and alcohol use between cisgender adults and transgender sub-identities: male to female (MTF), female to male (FTM), and gender nonconforming.

Results: Cigarette and smokeless tobacco use were higher among transgender adults. The gender nonconforming subgroup reported more binge and heavy drinking. In a multivariable logistic analysis, higher odds of smokeless tobacco use were found for all transgender sub-identities compared to cisgender females. The gender nonconforming group had higher odds of heavy drinking (AOR = 2.09, 95% CI 1.14–3.82) and binge drinking (AOR = 1.94, 95% CI 1.25–3.02) compared to cisgender females. The MTF subcategory was more likely to binge drink (AOR = 1.88, 95% CI 1.44–2.46) compared to cisgender females. The FTM subcategory had lower odds of binge drinking (AOR = 0.49, 95% CI 0.33–0.73) compared to cisgender males.

Conclusions: Significant heterogeneity in smokeless tobacco and alcohol use were found among transgender subgroups, particularly when compared to cisgender females. Our findings demonstrate that it is important to consider sub-identities in both the transgender population and in the reference cisgender population.

Introduction

Lesbian, gay, bisexual, and transgender (LGBT) populations have been found to experience multiple adverse health outcomes, including increased risk of depressive symptoms (Yarns, Abrams, Meeks, & Sewell, 2016), mood and substance use disorders (Gilman et al., 2001; Yarns et al., 2016), in addition to suicide and suicidal ideation (Gilman et al., 2001; Hottes, Bogaert, Rhodes, Brennan, & Gesink, 2016; Testa et al., 2017), which may be attributable to stressors from discrimination (Meyer, 2003). A negative health outcome that can arise from stress and discrimination is a high prevalence of tobacco use (Evans-Polce, Veliz, Boyd, Hughes, & McCabe, 2019; McCabe et al., 2019). Research that focuses exclusively on transgender use of tobacco and other substances is scant. The term “transgender” is identified by the Centers for Disease Control and Prevention as a person whose gender identity is not the same as their sex at birth (Centers for Disease Control and Prevention, 2017b). “Cisgender” refers to an individual whose gender identity is the

same as their sex at birth. “Gender nonconforming” refers to those without a binary gender identification (male or female) (Centers for Disease Control and Prevention, 2019). Using data from college students in Texas, a study found that transgender individuals had elevated odds of smokeless tobacco use compared to heterosexual participants (Hinds, Loukas, & Perry, 2018). Another study found that LGBT youth were less likely to use smokeless tobacco compared to non-LGBT students (Remafedi, Jurek, & Oakes, 2008). Similar to the mixed findings on smokeless tobacco use in the LGBT population, research on transgender use of alcohol is inconclusive with some studies finding significant differences when compared to cisgender adults (Coulter et al., 2015; Melendez et al., 2006) and others failing to produce similar results (Blosnich, Lehavot, Glass, & Williams, 2017).

The high prevalence of tobacco and substance use among LGBT populations that is found in some studies is thought to be related to the prejudice, homophobia, and amplified levels of stress that sexual and gender minorities face (Meyer, 2003), with transgender individuals

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<https://doi.org/10.1016/j.drugpo.2019.07.024>

specifically likely to experience violence and discrimination (Lombardi & van Servellen, 2000; Lombardi, Wilchins, Priesing, & Malouf, 2002). One study found that nearly 60% of transgender individuals in the U.S. had experienced violence or harassment (Lombardi et al., 2002). The minority stress model explains how stigma and discrimination contribute to heightened stress levels among sexual minority populations (Meyer, 2003). Increased levels of stress and stressful life events have been found to be associated with tobacco use (Leventhal et al., 2017) and alcohol use and cravings (José, van Oers, van de Mheen, Garretsen, & Mackenbach, 2000; Kim et al., 2014). Another possible contributor to the disproportionate prevalence of substance use is the targeting of campaigns and marketing aimed at LGBT communities (Drabble, 2000). Additionally, locations that have a high prevalence of smoking and drinking, such as bars, have historically been an important social setting for sexual minorities (Mileski & Black, 1972).

The literature on cisgender tobacco and alcohol use is well established. Compared to females, males are more likely to drink excessively (U.S. Department of Health and Human Services & Centers for Disease Control and Prevention, 2016) and use tobacco products (Lipari & Van Horn, 2017; World Health Organization, 2010). Contrarily, the extant literature on transgender tobacco and alcohol use is limited. Research on smokeless tobacco use among transgender populations is extremely scant and with mixed findings in the existing few studies. However, previous studies tend to treat transgender populations as homogenous with little to nothing known about differences between transgender sub-identities (e.g., male to female transgender, female to male transgender, or gender nonconforming) (Hinds et al., 2018; McElroy, Everett, & Zaniletti, 2011). Evidence suggests that studying the transgender community as a monolithic group may mask important intragroup differences (Crissman, Stroumsa, Kobernik, & Berger, 2019; White Hughto, Reisner, & Pachankis, 2015) and that differences exist on a variety of outcomes when separating by subcategory (Buchting et al., 2017; Motmans, Meier, Ponnet, & T'Sjoen, 2012). For example, higher rates of frequent mental distress were found for a female to male transgender and gender nonconforming groups when compared with a male to female group (Crissman et al., 2019). Prior research on transgender populations has also been limited by small and nonprobability samples (Conron, Scott, Stowell, & Landers, 2012; McElroy et al., 2011; Ortiz, Mamkherzi, Salloum, Matthews, & Maziak, 2017; Santos et al., 2014). To address the gaps in the extant literature, we examined whether cigarette, smokeless tobacco, and alcohol use vary by transgender sub-identities. Identifying a subpopulation with heightened risks of engaging in negative health behaviors is particularly important for prevention and harm reduction targeting.

Method

Data

We combined data from the 2014–2017 Behavioral Risk Factor Surveillance System (BRFSS) surveys. BRFSS was designed in the early 1980s by the Centers for Disease Control and Prevention (CDC) to collect data on noninstitutionalized residents' (age ≥ 18) health-related risk behaviors and events, chronic health conditions, and use of preventive services. The BRFSS uses two steps for weighting purposes: design weighting and iterative proportional fitting, also known as raking (Centers for Disease Control and Prevention, 2013). Since 2011, the BRFSS has collected participant information from all 50 states, the District of Columbia, and three U.S. territories using disproportionate stratified sampling for landlines and random sampling for cellular telephones (Centers for Disease Control and Prevention, 2013). With over 400,000 adult interviews completed annually, it is the largest consistently applied health-related survey in the world. The survey measures are reliable and valid (Nelson, Holtzman, Bolen, Stanwyck, & Mack, 2001). The BRFSS survey contains a core component, optional modules, and state-added questions. Questions related to transgender

self-identification are included in the Sexual Orientation and Gender Identity module. The module is optional, and the number of participating states varies from year to year (19 in 2014, 21 in 2015, 25 in 2016, and 27 in 2017). Details on participating states and territories are detailed by the CDC (Centers for Disease Control and Prevention, 2015, 2016, 2017a, 2018a). We restricted our study sample to the 720,020 responders who answered the question(s) related to transgender identity in the Sexual Orientation and Gender Identity module in the combined 2014–2017 BRFSS data.

Measures

Dependent variables

A total of six dichotomous variables were created to assess cigarette, smokeless tobacco, and alcohol consumption.

Cigarette smoking

Smoking status was captured from the following survey questions “Have you smoked at least 100 cigarettes in your entire life?” and “Do you now smoke cigarettes every day, some days, or not at all?” Every day smoker was defined as someone who smokes every day and had smoked at least 100 cigarettes in his or her lifetime. Current smoker was defined as someone who smokes every day or some days and had smoked at least 100 cigarettes in his or her lifetime.

Smokeless tobacco use

Use of smokeless tobacco products was assessed by the question “Do you currently use chewing tobacco, snuff, or snus every day, some days, or not at all?” Every day smokeless tobacco use was defined as using smokeless tobacco every day. Current smokeless tobacco use was defined as using smokeless tobacco every day or some days.

Alcohol use

Binge drinking and heavy drinking were defined differently for males and females, as is standard in the literature (Centers for Disease Control and Prevention, 2018b). Binge drinking was defined as having five or more drinks on one occasion for males and as having four or more drinks on one occasion for females. Heavy drinking was defined for males as having more than 14 drinks per week and for females as having more than 7 drinks per week. Gender nonconforming participants were categorized based on reported biological sex.

Independent variables

Transgender identity was assessed using the question “Do you consider yourself to be transgender?” The optional answers included “Yes, Transgender, male-to-female,” “Yes, Transgender, female to male,” “Yes, Transgender, gender nonconforming,” “No,” “Don't know/Not Sure,” “Refused,” and “Not asked or Missing.” In our study, we excluded responders who answered “Don't know/Not sure”, refused, or did not answer the question. We also divided the transgender group into sub-identities: male to female (MTF), female to male (FTM), and gender nonconforming. We further divided the “no” (cisgender) group into cisgender male and cisgender female based on the respondents self-identified sex.

Age and race were obtained from the calculated variables in the combined BRFSS data. Age was categorized as 18–24, 25–34, 35–44, 45–54, 55–64, and 65+; race was categorized as White, Black, Hispanic, and other. Sex, marital status, education level, employment, and income were obtained from related survey questions. We further classified employment as yes (employed for wages or self-employed) or no. We used the responder's state identification to classify our subjects

into one of 4 regions using the same regional classification system as the U.S. Census Bureau (U.S. Census Bureau, n.d.), and we classified Guam into the Western region.

Statistical methods

Demographics and socioeconomic characteristics were described by the gender identity groups (MTF, FTM, gender nonconforming, and cisgender). The weighted frequency was reported for all categorical variables. Rao-Scott Chi-square tests were used for comparing characteristics among the four groups. In the base analysis, we used transgender as one category as has been done in previous studies. Cisgender (male and female combined), cisgender male, and cisgender female were used as reference categories for three separate multivariable logistic regressions that examined disparities in cigarette, smokeless tobacco, and alcohol consumption between transgender and cisgender adults. In the main analysis, we examined the disparities in cigarette, smokeless tobacco, and alcohol consumption between transgender subcategories (MTF, FTM, gender nonconforming) and different cisgender reference categories (male and female). In all multivariable analyses, age, race, education level, employment status, region, and year were included as covariates. All of the statistical analyses were performed using SAS 9.4 (SAS Institute, Inc. Cary, NC) and *p*-values < .05 were considered statistically significant.

Results

Among the 720,020 adults included in the study, 1490 (0.21%) identified as transgender MTF, 941 (0.13%) identified as transgender FTM, 632 (0.09%) identified as gender nonconforming, 306,046 (42.51%) identified as cisgender female and the remaining 410,828 (57.06%) identified as cisgender male. The distribution of demographic characteristics and cigarette, smokeless tobacco, and alcohol consumption according to transgender identity subgroups is listed in Table 1. Transgender participants were more likely to be in the young age group (19.1% for MTF, 23.1% for FTM, 27.6% for gender nonconforming) compared to cisgender male (12.7%) and cisgender female (11.1%). The racial distributions were significantly different among transgender identity subgroups. FTM had the highest percentage of those who identified as Black (16.9%). FTM (21.4%) and gender nonconforming (22.9%) had a higher percentage of those who identified as Hispanic compared to cisgender male (16.3%) and cisgender female (15.5%). MTF (26.3%) and FTM (23.5%) had higher percentages of those who did not graduate high school compared to cisgender male (16.3%) and cisgender female (15.5%). We found that approximately 20.6% of MTF, 20.9% of FTM, 16.3% of gender nonconforming, and 16.4% of cisgender participants reported smoking every day or some days. For smokeless tobacco, approximately 7.9% of MTF, 7.2% of FTM, 6.1% of gender nonconforming, and 3.4% of cisgender participants reported using smokeless tobacco every day or some days. Among gender nonconforming individuals, 8.6% reported heavy drinking and 22.7% reported binge drinking.

Cigarette smoking

Table 2 presents the result of a logistic regression examining cigarette smoking, smokeless tobacco use, and alcohol consumption on transgender status. When a single transgender group was compared to a single cisgender group, no significant differences were found. However, when compared to cisgender females, results showed that the transgender group had higher odds of current smoking (AOR = 1.23, 95% CI 1.02–1.48). Once the transgender group was split into subcategories, no significant results related to cigarette smoking were found when compared to a cisgender male reference group (Table 3). However, when compared to cisgender females (Table 4), higher odds of every day smoking were found in the FTM subcategory (AOR = 1.61, 95% CI

Table 1

Weighted summary statistics of all study cohort, 2014–2017 (N = 720,020).

	Male to female	Female to male	Gender nonconforming	Cisgender
n,(%)	1490 (0.21)	941 (0.13)	632 (0.09)	716,957 (99.57)
Age				
18-24	19.1	23.1	27.6	11.9
25-34	13.1	14.1	24.7	15.8
35-44	14.7	16.4	11.9	16.1
45-54	16.4	16.5	9.2	17.7
55-64	19.5	12.2	15.3	17.6
65+	17.3	17.7	11.4	21
Sex				
Male	72.9	29.6	49.8	48.1
Female	27.1	70.4	50.2	51.9
Race				
White	56.9	55	51.2	64.6
Black	13.9	16.9	12.9	11.4
Hispanic	18.1	21.4	22.9	15.9
Others	11.1	6.7	13	8.1
Education level				
Did not graduate High School	26.3	23.5	15.5	13.7
Graduated High School	34.5	36.1	31.1	28.4
Attended College or Technical School	26.4	29.3	36.2	31
Graduated from College or Technical School	12.8	11.1	17.3	26.9
Employment				
Yes	53.9	48.3	45.1	57.1
No	46.1	51.7	54.9	42.9
Region				
Midwest	27.3	28.2	23	26.6
Northeast	22.2	19.7	30.1	23.8
South	39.2	39.7	26.3	31.6
West	11.4	12.4	20.5	18
Current smoker				
Yes	20.5	20.9	16.3	16.4
No	79.5	79.1	83.7	83.6
Current smokeless tobacco use				
Yes	7.9	7.2	6.1	3.4
No	92.1	92.8	93.9	96.6
Every day smoker				
Yes	13.5	17.2	8.4	11.2
No	86.5	82.8	91.6	88.8
Every day smokeless tobacco use				
Yes	4.3	2.6	4.3	1.8
No	95.7	97.4	95.7	98.2
Heavy drinker				
Yes	5.1	7.2	8.6	6.1
No	94.9	92.8	91.4	93.9
Binge drinker				
Yes	18.8	12.9	22.7	16.6
No	81.2	87.1	77.3	83.4

n represents unweighted frequency. For categorical variables, weighted frequency are presented and the distribution of all presented variables among sexual orientation group were significant ($P < .001$).

1.12–2.30).

Smokeless tobacco use

Higher odds of every day smokeless tobacco use (AOR = 2.06, 95% CI 1.45–2.92) and current smokeless tobacco use (AOR = 1.97, 95% CI 1.52–2.56) were found among the single transgender group when compared to the single cisgender group (both males and females) (Table 2). Compared to cisgender females, the single transgender group had higher odds of smokeless tobacco use (AOR = 11.35, 95% CI 7.81–16.51 for every day smokeless tobacco use; AOR = 7.54, 95% CI

Table 2
Logistic regression of cigarette, smokeless tobacco, and alcohol consumption on transgender status.

	Transgender	Cisgender	Transgender	Cisgender Male	Transgender	Cisgender Female
Every day smoker	1.05 (0.87, 1.28)	Ref	0.98 (0.81, 1.19)	Ref	1.18 (0.97, 1.43)	Ref
Current smoker	1.10 (0.91, 1.34)	Ref	0.93 (0.78, 1.12)	Ref	1.23 (1.02, 1.48)*	Ref
Every day smokeless tobacco use	2.06 (1.45, 2.92)*	Ref	1.10 (0.77, 1.56)	Ref	11.35 (7.81, 16.51)*	Ref
Current smokeless tobacco use	1.97 (1.52, 2.56)*	Ref	1.10 (0.84, 1.43)	Ref	7.54 (5.75, 9.90)*	Ref
Heavy drinking	1.10 (0.82, 1.48)	Ref	1.03 (0.77, 1.38)	Ref	1.21 (0.90, 1.62)	Ref
Binge drinking	1.07 (0.88, 1.31)	Ref	0.79 (0.64, 0.96)	Ref	1.60 (1.31, 1.96)*	Ref

* Odds ratios are significant at 5% significance level. Odds ratios and 95% confidence intervals are presented in the table adjusted for age, race, education level, employment status, region, and year. Ref = reference category. Every day smoker smoked at least 100 cigarettes in their lifetime and currently smoke every day. Current smoker smoked at least 100 cigarettes in their lifetime and currently smoke every day or some days. Current smokeless tobacco was defined as using smokeless tobacco every day or some days. Heavy drinking was defined as a male having more than 14 drinks per week or a female having more than 7 drinks per week.

5.75–9.90 for current smokeless tobacco use). However, no significance was found for smokeless tobacco use when comparing the single transgender group to cisgender males. No significance was found when the transgender group was analyzed by subcategories and compared to a cisgender male reference group (Table 3); however, significant results were found when comparing transgender subcategories to a cisgender female reference group (Table 4). All subcategories had higher odds of every day smokeless tobacco use (MTF AOR = 12.47, 95% CI 7.66–20.30; FTM AOR = 7.29, 95% CI 3.03–17.52; gender nonconforming AOR = 15.21, 95% CI 7.88–29.35) and current smokeless tobacco use (MTF AOR = 8.10, 95% CI 5.69–11.51; FTM AOR = 7.16, 95% CI 4.13–12.39; gender nonconforming AOR = 6.71, 95% CI 3.79–11.86) compared to cisgender females.

Alcohol use

When transgender was treated as a single group, and cisgender (male and female) were treated as a single group, there were no statistically significant differences in alcohol consumption. The transgender group had higher odds of binge drinking (AOR = 1.60, 95% CI 1.31–1.96) when compared to a cisgender female reference group, but lower odds of binge drinking (AOR = 0.79, 95% CI 0.64–0.96) when compared to cisgender males. After separating the transgender group into subcategories (Tables 3 and 4), the FTM subcategory had significantly lower odds of binge drinking (AOR = 0.49, 95% CI 0.33–0.73) when compared to cisgender males. When compared to cisgender females, higher odds of binge drinking were found in the MTF subcategory (AOR = 1.88, 95% CI 1.44–2.46) and the gender nonconforming subcategory (AOR = 1.94, 95% CI 1.25–3.02). The gender-nonconforming subcategory also had higher odds of heavy drinking (AOR = 2.09, 95% CI 1.14–3.82).

Table 3
Logistic regression of cigarette, smokeless tobacco, and alcohol consumption on transgender subcategories.

	Male to female	Female to male	Gender nonconforming	Cisgender Male
Every day smoker	0.91 (0.70, 1.18)	1.34 (0.94, 1.92)	0.66 (0.42, 1.06)	Ref
Current smoker	0.93 (0.72, 1.21)	1.01 (0.72, 1.41)	0.82 (0.56, 1.21)	Ref
Every day smokeless tobacco use	1.21 (0.75, 1.93)	0.71 (0.30, 1.68)	1.47 (0.77, 2.81)	Ref
Current smokeless tobacco use	1.18 (0.83, 1.66)	1.04 (0.60, 1.79)	0.98 (0.55, 1.72)	Ref
Heavy drinking	0.85 (0.52, 1.37)	1.11 (0.66, 1.86)	1.34 (0.80, 2.26)	Ref
Binge drinking	0.93 (0.71, 1.21)	0.49 (0.33, 0.73)*	0.95 (0.61, 1.49)	Ref

* Odds ratios are significant at 5% significance level. Odds ratios and 95% confidence intervals are presented in the table adjusted for age, race, education level, employment status, region, and year. Ref = reference category. Every day smoker smoked at least 100 cigarettes in their lifetime and currently smoke every day. Current smoker smoked at least 100 cigarettes in their lifetime and currently smoke every day or some days. Current smokeless tobacco use was defined as using smokeless tobacco every day or some days. Heavy drinking was defined as a male having more than 14 drinks per week or a female having more than 7 drinks per week.

Discussion

The prevalence of cigarette smoking has decreased in the general population (U.S. Department of Health and Human Services, 2014), and yet it remains high among specific populations such as the LGBT population. Findings from the few existing studies on transgender substance use, including tobacco, are discordant (Blosnich et al., 2017; Buchting et al., 2017; Coulter et al., 2015; Hinds et al., 2018; Hoffman, Delahanty, Johnson, & Zhao, 2018; Lee, Griffin, & Melvin, 2009; Melendez et al., 2006; Meyer, Brown, Herman, Reisner, & Bockting, 2017; Remafedi et al., 2008). For example, some studies suggest that transgender populations smoke cigarettes at higher rates when compared to the general population (Buchting et al., 2017; Lee et al., 2009), and non-significant findings have been reported elsewhere (Hoffman et al., 2018; Meyer et al., 2017). The transgender community is a vulnerable population, with more social and health issues than other groups (Lombardi, 2001). The previous studies on association between transgender identity with tobacco and substance use have been limited by small sample sizes (Conron et al., 2012; McElroy et al., 2011; Santos et al., 2014). Additionally, prior research has been restricted by grouping all transgender individuals together (Conron et al., 2012; McElroy et al., 2011) or only examining one gender (Santos et al., 2014). Research has suggested differences in a variety of outcomes when separating a transgender population by subcategory (Buchting et al., 2017; Motmans et al., 2012). The present study augments the literature by addressing two important weaknesses common to previous studies: treating the transgender community as homogenous and the use of small sample size. First, this study examined potential transgender sub-identity differences in substance use. Secondly, this study used a large national survey that has been validated.

We found that when compared to cisgender females, all transgender subcategories had higher odds of every day smokeless tobacco use and current smokeless tobacco use. This finding is in keeping with previous

Table 4
Logistic regression of cigarette, smokeless tobacco, and alcohol consumption on transgender subcategories.

	Male to female	Female to male	Gender nonconforming	Cisgender Female
Every day smoker	1.10 (0.84, 1.42)	1.61 (1.12, 2.30) [*]	0.80 (0.50, 1.28)	Ref
Current smoker	1.23 (0.95, 1.60)	1.33 (0.95, 1.86)	1.09 (0.84, 1.60)	Ref
Every day smokeless tobacco use	12.47 (7.66, 20.30) [*]	7.29 (3.03, 17.52) [*]	15.21 (7.88, 29.35) [*]	Ref
Current smokeless tobacco use	8.10 (5.69, 11.51) [*]	7.16 (4.13, 12.39) [*]	6.71 (3.79, 11.86) [*]	Ref
Heavy drinking	1.02 (0.58, 1.82)	1.71 (0.90, 3.23)	2.09 (1.14, 3.82) [*]	Ref
Binge drinking	1.88 (1.44, 2.46) [*]	0.99 (0.67, 1.48)	1.94 (1.25, 3.02) [*]	Ref

* Odds ratios are significant at 5% significance level. Odds ratios and 95% confidence intervals are presented in the table adjusted for age, race, education level, employment status, region, and year. Ref = reference category. Every day smoker smoked at least 100 cigarettes in their lifetime and currently smoke every day. Current smoker smoked at least 100 cigarettes in their lifetime and currently smoke every day or some days. Current smokeless tobacco use was defined as using smokeless tobacco every day or some days. Heavy drinking was defined as a male having more than 14 drinks per week or a female having more than 7 drinks per week.

research showing that transgender individuals were more likely to use smokeless tobacco (Hinds et al., 2018). However, it is essential to note that other research has found LGBT groups less likely to use smokeless tobacco compared to non-LGBT youth (Remafedi et al., 2008). It is plausible that these mixed findings are, in part, due to differences in how transgender is operationalized. For example, some studies include transgender individuals with lesbian, gay, and bisexual peers (Remafedi et al., 2008), and other studies lump transgender participants in with those who identified as “queer” or “other” (Hinds et al., 2018). The lack of consistent definitions and results highlights the need for a more granular definition of transgender identity given that those that self-identify under different labels are less likely to share similar patterns of behavior.

Results showed that the FTM group had significantly lower odds of binge drinking when compared to cisgender males. However, there was no difference found when compared to cisgender females. It is possible that the FTM group is more inclined to smoke tobacco, as they reported the highest rates of smoking every day and the lowest rates of binge drinking. It remains unknown to what extent this group is socializing less and have fewer opportunities to drink socially. Furthermore, the significant differences in transgender vs cisgender female cigarette smoking may be driven mainly by the FTM participants, as the sub-identity analysis showed significantly higher odds of cigarette use only for the FTM group. This is consistent with past research that showed a higher past 30-day cigarette use among FTM when compared to MTF counterparts, although this result was not statistically significant (Buchting et al., 2017). Overall, our findings highlight the importance of using subcategories for transgender identity and the type of reference category for comparison given that results significantly differ based on the reference group, and a prior study shows that females use smokeless tobacco at a much lower rate than men (Center for Behavioral Health Statistics and Quality, 2017).

The findings of this study also suggest that gender nonconformity is an important subgroup among transgender adults, with results showing that gender nonconforming individuals had higher odds of heavy drinking and binge drinking when compared to cisgender females. Prior research suggests that gender nonconforming transgender individuals experience more discrimination than gender conforming peers, and are therefore more likely to have an elevated risk of negative health outcomes (Miller & Grollman, 2015). Additionally, one study found that gender nonconforming identity is associated with mental distress and substance use (particularly in males) among school-age students (Lowry et al., 2018). These findings, coupled with our results that gender nonconforming individuals had high odds of binge and heavy drinking, further indicate the need to study transgender populations by subgroups. Furthermore, a potential limitation of existing surveys is that classification of binge and heavy drinking is based on biological sex, presenting a possible misclassification, especially for those that are gender nonconforming. Future research should explore how gender

self-identity and biological sex may conflict or interact with the current definitions of binge and heavy drinking.

An extension of the minority stress model has been suggested for gender minority populations such as transgender and gender nonconforming, as they experience added stressors due to the stigma associated with discordant gender identity or expression (Hendricks & Testa, 2012). Research has found that transgender populations experience limited opportunities, in areas such as employment and health-care, with stigma operating at multiple levels including structural, interpersonal, and individual (White Hughto et al., 2015). Stress can stem from issues such as inequities in employment, healthcare, and housing, especially in comparison to cisgender populations (White Hughto et al., 2015). This consistent and pervasive stress has been linked to substance abuse, which is a coping mechanism (Meyer, 2003; Reisner, Greytak, Parsons, & Ybarra, 2015). Another possible explanation of the higher use of tobacco and alcohol products is related to the social environment that sexual and gender minority populations frequent. Bars have historically been an important social environment for sexual minorities (Mileski & Black, 1972), and such locations are known to have a high prevalence of smoking and drinking. Additionally, the tobacco industry has engaged in aggressive marketing campaigns aimed at LGBT communities (Drabble, 2000).

Some limitations of this study are worth noting. The data source is a survey that relies on information reported by the participant and may, therefore, be subject to response error due to inaccurate recall of events or experiences. It remains unknown to what extent respondents hide their identity as transgender, and thus excluding those who answered “Don’t know/Not sure” about their gender identity may leave some findings unexplored. Another limitation is the cross-sectional nature of the study, which does not allow for identifying temporality. No claim of causality is made in the present study. The results of this study suggest the need for research involving transgender to consider subgroups within this community. Collapsing transgender subcategories into one group may mask significant differences, and the reference category for comparison matters.

Conclusion

This study used data from a large probability-based sampling to examine disparities in cigarette, smokeless tobacco, and alcohol use between transgender and cisgender groups. Results revealed significant heterogeneity in transgender subgroups, particularly when compared to cisgender females. Consistently higher odds of smokeless tobacco use were found for all transgender subgroups (MTF, FTM, and gender nonconforming) compared to cisgender females. Gender nonconforming individuals had a higher likelihood of heavy drinking and binge drinking compared to other gender identities. Prior research on transgender populations has been limited by small and nonprobability samples, potentially leading to masking of significant differences

between transgender subgroups. Our findings suggest the need to consider sub-identities within the transgender population as well as the cisgender reference population.

Funding

None.

Declaration of Competing Interest

None.

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