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Heavy episodic drinking among transgender persons: Disparities and predictors



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ABSTRACT

Background: Drawing on a survey of transgender people in Canada's most populous province, we estimate the frequency of heavy episodic drinking (HED), compare HED prevalence to the age-standardized background population, and examine associations with socio-demographics, gender transition, and social exclusion.

Methods: 433 transgender persons aged 16+ completed a respondent-driven sampling survey in 2009–2010. Analyses were weighted using RDS II methods, including frequencies and prevalence ratios. Overall and sex-specific estimates of HED among Ontario residents in the 2009–2010 Canadian Community Health Survey ($n = 39,980$) were standardized to the overall and gender-specific transgender age distributions.

Results: Estimated prevalence of HED at least monthly among transgender Ontarians was 33.2% (95% CI: 26.3, 40.1), 1.5 times greater than expected based on the age-standardized Ontario population. Trans-masculine (female-to-male spectrum) persons were more likely than transfeminine persons to report HED (42.2% versus 22.7%), an effect robust to covariate adjustment. Current sex work was associated with greater HED, but gender transition and social exclusion factors were not.

Conclusion: Gendered pathways to alcohol misuse, particularly among transmasculine persons, warrant further research and intervention development.

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1. Introduction

Hazardous alcohol consumption contributes substantially to the global burden of morbidity and mortality (Rehm et al., 2009). Negative health consequences of alcohol use disproportionately impact poor and socially marginalized groups (Rehm et al., 2009), some of whom (e.g., sexual minorities; Keyes et al., 2011) also have higher rates of disordered and non-disordered use. Less is known about alcohol use among transgender (trans) people, those with a gender identity that differs from their birth-assigned sex. Trans people represent an estimated 0.6% of the adult population in the United States (Flores et al., 2016). In a random sample of substance use research published in 2007 and 2012, only 1.3% of articles reported data on transgender identities (Flentje et al., 2015). Population-based estimates of alcohol use are particularly scarce due to the lack of measures to identify trans respondents in most population

health surveys. Understanding of the epidemiology of alcohol use among trans people is further challenged by the limited and non-validated substance use measures often included in trans surveys, and absence of comparison groups (Keuroghlian et al., 2015).

Much trans substance use research has focused on urban trans women living with or at high risk for HIV, who frequently report heavy alcohol use (Nuttbrock et al., 2014; Santos et al., 2014). Findings from broader trans populations in the United States have been more mixed. In a population-based sample of Massachusetts adults including 131 transgender persons, no difference was found in the prevalence of past-month heavy episodic drinking (HED) by transgender status (Conron et al., 2012). Other studies have been limited to national samples of U.S. adolescents and college students. Reisner et al. (2014) found that trans youth reported higher past-year alcohol use than their cisgender (non-trans) peers, while Coulter et al. (2015) found that trans students were less likely to report HED than cisgender (non-trans) males, but had a greater number of recent HED days.

Disparities in alcohol misuse between cisgender and trans populations may be mediated by social stigma (Reisner et al., 2014). Associations between stigma and alcohol misuse are well-

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documented in non-trans minority populations (Keyes et al., 2011). Among trans people, problematic substance use has been conceptualized as a consequence of minority stress processes that result from a stigmatizing social environment. These processes include external, stigma-related stressors (e.g., violence), anticipation of such stressors, internalized stigma, and concealment of gender identity (Hendricks and Testa, 2012; Meyer, 1995). For example, anti-transgender violence and discrimination have been associated with increased risk of problematic alcohol use (Bradford et al., 2013; Coulter et al., 2015; Nuttbrock et al., 2014; Rowe et al., 2015).

Trans people face systemic barriers to employment, and may rely on sex work for income (Hoffman, 2014). Trans sex workers have reported higher levels of substance use than other trans people (Keuroghlian et al., 2015; Nuttbrock et al., 2014), perhaps due to greater minority stress (Nuttbrock et al., 2014), exposure to violence, and social network norms (Hoffman, 2014). In addition to enacted stigma in adulthood, sexual and gender minority populations disproportionately experience childhood sexual abuse. Such abuse is linked to increased risk of problematic alcohol use later in life (Schneeberger et al., 2014). However, while most trans people encounter some degree of stigma, negative coping responses are by no means inevitable. Potentially protective factors against alcohol misuse include family support (Newcomb et al., 2012).

Gender transition, including social, medical, psychological, and legal processes of gender affirmation (Reisner et al., 2016), is associated with improved mental health for trans people (Bauer et al., 2015) and could also be protective against alcohol misuse. However, findings regarding gender transition and alcohol use have been inconsistent, which may reflect countervailing impacts of heightened exposure to stigma resulting from transition. Among trans women in San Francisco, hormone therapy and breast augmentation were associated with lower odds of past-year HED (Wilson et al., 2014). Conversely, in a cohort of trans women in New York, heavy alcohol use was higher among those living full-time as women or taking hormones (Nuttbrock et al., 2014).

In summary, findings regarding both disparities and predictors of HED in trans communities have been somewhat inconsistent. To date, no published research has investigated alcohol use among trans people in Canada, where the social and health context for trans people varies from the United States by virtue of greater human rights protections and a universal health care system. The objectives of the current study were (1) to describe the prevalence of HED among trans people in Ontario, Canada; (2) to compare HED prevalence to the age-standardized cisgender population of Ontario; and (3) to assess the impacts of socio-demographic characteristics, gender transition, and social exclusion on HED.

2. Methods

The Trans PULSE community-based participatory research project recruited 433 trans Ontarians via respondent-driven sampling (RDS) in 2009–2010, including 404 who completed alcohol use measures. Eligible participants needed to be 16 years of age or older; live, work, or receive health care in Ontario; and indicate that they identified as transgender, transsexual, or transitioned. This definition included individuals who identified as genderqueer or another non-binary gender identity, and participants were not required to have undergone any social or medical gender transition.

RDS is a chain-referral sampling and analysis method for hidden populations (Heckathorn, 1997). Beginning with 16 seed participants selected for maximum diversity, each respondent was provided with three tracked recruitment coupons for recruiting their peers. Twenty-two additional seeds were added after 4–5 waves of recruitment. Maximum chain length was ten waves beyond the seeds. Respondents completed a 60–90-min survey

online or by visually-identical paper copy. They were compensated with a \$20 gift card, or could opt to donate the honorarium to a trans-related charity. Secondary incentives for recruitment of peers (\$5 gift cards) were added in the final months of the study, with no perceptible impact on recruitment. Research ethics boards at The University of Western Ontario and Wilfrid Laurier University approved this study. Research procedures and demographic characteristics pertaining to the Trans PULSE study population have been described in greater detail previously (Bauer et al., 2012).

A portion of this analysis used data from the Canadian Community Health Survey (CCHS) from Ontarians aged 16+ ($n = 39,980$). The 2009–2010 data cycles were used to match the time of recruitment of Trans PULSE data. CCHS is an ongoing cross-sectional survey of Canadians aged 12 and above employing a multi-stage, stratified, cluster sampling approach, with coverage of over 97% of the Canadian population (excluding institutionalized persons and those living on First Nations reserves). Additional information about the survey methodology is available from Statistics Canada (2010). CCHS estimates describe the assumed cisgender population because the survey did not include measures to identify trans respondents. Under the reasonable assumption that the population prevalence of trans people in Ontario, Canada is relatively similar to that of the United States (about 0.6%; Flores et al., 2016), the inclusion of trans persons within the assumed cisgender comparison group would not have a significant impact on results.

2.1. Measures

2.1.1. Heavy episodic drinking. Trans PULSE and CCHS participants were asked how often they consumed five or more alcoholic drinks on one occasion in the past year. Response options ranged from “never” to “more than once a week”. For comparisons between the two populations and regression analyses, HED was defined as reporting consuming five or more alcoholic drinks on one occasion at least monthly in the past year.

2.1.2. Sociodemographic factors. Socio-demographic characteristics included age, gender spectrum (transfeminine or transmasculine, i.e., natal male or female respectively, including those who identify as neither men nor women), Toronto residence (Ontario's capital and largest urban center, based on postal code), ethno-racial group (Aboriginal, white, or non-Aboriginal person of color), educational attainment, and sexual minority identity (coded as yes if the respondent endorsed any non-heterosexual identity). Reported childhood physical or sexual abuse was included as a background factor.

2.1.3. Transition. Participants indicated how often they lived in their felt gender (dichotomized as full-time versus part-time or less) and described their medical transition status as not planning, unsure, or not applicable; planning but not begun; in process; or complete based on self-perceived needs.

2.1.4. Social exclusion and inclusion, sex work, and depression. The research team developed an 11-item scale measuring the frequency of lifetime experiences of both external and internalized anti-trans stigma (Cronbach's $\alpha = 0.81$; Marcellin et al., 2013), adapted from a measure of homophobia (Diaz et al., 2001). Other social exclusion and inclusion variables included lifetime experience of physical or sexual assault related to being trans (yes versus no), Medical Outcomes Study social support scale scores (Sherbourne and Stewart, 1991; Cronbach's α in our data = 0.97), employment status (full-time, part-time, student, or other), and low income status (Statistics Canada low-income cut-off; LICO; Health Canada, 2009). Underhousing was defined as current homelessness, living in sub-standard or temporary housing, or trouble meeting housing costs

in combination with household income below the LICO. Perceived or expected parental support for gender identity or expression was dichotomized as strongly supportive versus not. Both lifetime and current sex work were assessed in the questionnaire, and the latter was included in this analysis. Depressive symptoms were measured with the Center for Epidemiological Studies Depression scale (Cronbach's $\alpha = 0.93$; Radloff, 1977)

2.2. Statistical analysis

Weighted frequencies and their associated 95% confidence intervals (CIs) for Ontario's networked trans population were calculated in SAS (version 9.3, SAS Institute Inc., Cary, NC). RDS II weights were employed, which are estimated as the inverse of the number of target population members known, rescaled to sum to the sample size (Volz and Heckathorn, 2008). These weights adjust for unequal recruitment probabilities due to personal network size, generating estimates for the networked target population. CIs were estimated using Taylor series linearization and variances were adjusted for clustering by shared recruiter to account for non-independence within recruitment chains (Szwarwald et al., 2011).

For comparison with the trans population frequencies, overall and sex-specific past-year weighted prevalence estimates for HED among Ontarians aged 16+ (CCHS data) were directly standardized to the overall and gender-spectrum-specific age distributions of trans Ontarians. Six age categories were employed: 16–24, 25–34, 35–44, 45–54, 55–64, and 65+. This method (Giblon and Bauer, in preparation) enables comparisons of trans population prevalence with expected prevalence in the general population, were its age distribution to match the younger age distribution of the trans population, which is particularly pronounced among transmasculine persons (Bauer et al., 2012). We did not standardize for (assigned) sex, as proportions within the Trans PULSE data were equivalent to the Ontario population. Standardized prevalence differences (SPDs) were estimated by subtracting the expected prevalences (age-adjusted from CCHS data) from observed prevalences of HED in the trans population. Zou and Donner's Method of Variance Estimates Recovery (2008) was used to construct 95% CIs around the difference in proportions. This method recovers variance information from the confidence limits of the independent proportions to construct confidence limits around their difference. It provides a means of testing for statistically significant differences between RDS-weighted proportions, for which standard statistical tests are inappropriate (Bauer et al., 2012; Scheim and Bauer, 2014), as well as proportions arising from different data structures. Differences in proportions are significant at $p < 0.05$ where those CIs exclude 0. Comparisons of HED prevalence were made between each gender spectrum and both (assumed cisgender) males and females in the broader Ontario population (i.e., by both natal sex and group most closely aligned with current gender identity), as alcohol misuse may have both biological and social components.

Weighted logistic regression models were used to estimate prevalence ratios (PRs) via average marginal predictions (Bieler et al., 2010) in SAS-callable SUDAAN (version 11, RTI International, Research Triangle Park, NC). Age and scale scores were entered into regression models as continuous, but PRs are presented as comparisons of reference values, as required for their estimation. After estimating bivariate associations for all covariates, a multivariable socio-demographic model was fit to estimate adjusted prevalence ratios (APRs) for socio-demographic correlates. Next, a blockwise procedure was employed to fit multivariable models for other covariates of interest, adjusting for age and socio-demographic factors significant at $p < 0.05$ in the multivariable socio-demographic model. Blocks of variables related to transition, social exclusion/inclusion, sex work, and depression were entered in turn. For parsimony, variables were only retained in subsequent modeling

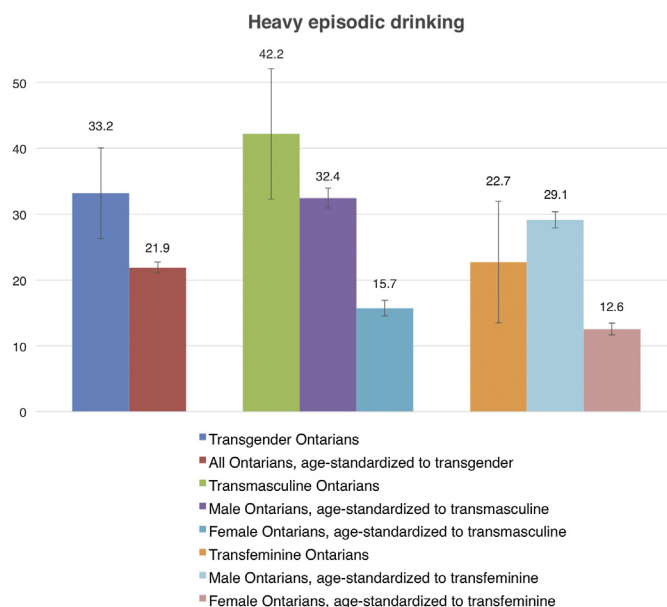


Fig. 1. Past-year heavy episodic drinking at least monthly among transgender Ontarians and the age-standardized Ontario population, 2009–2010. Note: Error bars indicate 95% confidence intervals.

steps if their p -value from a Wald F-test was < 0.25 . This modeling approach aimed (a) to account for temporal ordering to the extent possible with cross-sectional data and to control for non-modifiable demographic characteristics, (b) to avoid inappropriate adjustment for mediators, and (c) to assess the impacts of social exclusion above and beyond those of gender transition. Analyses were repeated with stratification by gender spectrum, but results did not substantively differ, and thus only analyses for the full sample are reported.

Of the 404 participants who completed alcohol use measures, seven were excluded from regression analyses because they were missing data on more than 20% of covariates. Participants excluded due to missing data were not significantly different than other participants with respect to the sociodemographic variables included in this analysis. For multivariable analyses only, simple imputation of the median, mean, or mode was used to avoid participant loss in a complete case analysis. Less than 2% of data were missing for all but three variables included in this analysis; no variables were missing more than 10% of data.

3. Results

Approximately one-third of trans Ontarians reported heavy episodic drinking at least monthly in the past year (33.2%, 95% CI: 26.3, 40.1), including 10.9% (95% CI: 5.8, 16.1) who engaged in HED weekly or more. As shown in Fig. 1, this estimated prevalence of HED at least monthly was 1.5 times greater than the prevalence expected based on the age-standardized assumed cisgender population of Ontario (21.9%, 95% CI: 21.1, 22.7), with 11.3% of trans persons reporting HED beyond what would be expected (SPD = 11.3%; 95% CI: 4.4, 18.2; $p = 0.001$).

By gender spectrum, 22.7% (95% CI: 13.5, 32.0) of transfeminine persons and 42.2% (95% CI: 32.3, 52.1) of transmasculine persons reported HED at least monthly, a prevalence difference of 19.5% (95% CI: 5.9, 33.0; $p = 0.005$). This difference was attributable to higher levels of occasional binge drinking (one to three times per month) among transmasculine persons (31.1% versus 12.0%); equal proportions of transmasculine and transfeminine persons reported

Table 1

Weighted socio-demographic characteristics of transgender people in Ontario, Canada and associations with heavy episodic drinking (n = 397).

	Weighted frequencies		Heavy episodic drinking			
	% or mean	(95% CI)	Prevalence ratio (bivariate)		Adjusted prevalence ratio ^a	
			PR	(95% CI)	PR	(95% CI)
Age (years)^b	32.5	(30.3, 34.7)				
30 versus 20	–		0.88	(0.72, 1.07)	0.98	(0.81, 1.17)
40 versus 20	–		0.76	(0.50, 1.16)	0.95	(0.66, 1.37)
Transmasculine spectrum	55.5	(47.6, 63.4)	1.93 ^{**}	(1.19, 3.13)	1.82 [*]	(1.09, 3.06)
Toronto residence	38.8	(30.9, 46.6)	1.34	(0.88, 2.03)	1.39	(0.92, 2.11)
Race/ethnicity						
White	77.6	(71.5, 83.7)	1		1	
Aboriginal	6.5	(3.2, 9.8)	0.6	(0.22, 1.60)	0.63	(0.24, 1.62)
Non-Aboriginal person of color	15.9	(10.5, 21.3)	0.72	(0.36, 1.44)	0.58	(0.29, 1.15)
Childhood abuse	70	(62.8, 77.1)	0.89	(0.56, 1.42)	0.89	(0.58, 1.35)
Education						
Less than high school	11.5	(6.8, 16.1)	1.95	(1.09, 3.49)	1.6	(0.90, 2.84)
High school diploma	16.1	(10.4, 21.8)	1.17	(0.58, 2.36)	0.91	(0.46, 1.78)
Some college/university	27.1	(20.1, 34.1)	1.52	(0.92, 2.53)	1.53	(0.98, 2.38)
College or university	45.3	(37.6, 53.0)	1.00		1.00	
Sexual minority	64.3	(56.5, 72.1)	0.77	(0.50, 1.18)	0.75	(0.52, 1.09)

^{*} = p < 0.05.^{**} = p ≤ 0.001.^a Adjusted for all other variables in the table; Nagelkerke R² = 0.15.^b Modeled as continuous in logistic regression, reference levels required for presentation of prevalence ratios.**Table 2**

Weighted frequencies and bivariate associations for potential predictors of heavy episodic drinking among transgender people in Ontario, Canada (n = 397).

	Weighted frequencies		Prevalence ratio (bivariate)	
	% or mean	(95% CI)	PR	(95% CI)
Living full-time in felt gender	51.9	(43.5, 60.3)	1.04	(0.69, 1.57)
Medical transition status				
Complete	27.0	(20.4, 33.7)	1.00	
In process	24.3	(18.1, 30.5)	0.93	(0.51, 1.72)
Planning but not begun	28.5	(21.1, 35.9)	1.46	(0.87, 2.44)
Not planning, unsure, N/A	20.2	(13.1, 27.2)	0.85	(0.41, 1.75)
Transphobia				
Mean (range = 0–33)	13.8	(12.8, 14.8)	–	–
75th versus 25th percentile	–		0.89	(0.65, 1.22)
Transphobic assault	20.3	(14.5, 26.1)	1.36	(0.87, 2.12)
Social support				
Mean (range = 0–5)	3.5	(3.3, 3.7)	–	–
75th versus 25th percentile	–		–	(0.70, 1.36)
Strong parental support for gender	24.7	(18.5, 30.9)	0.86	(0.50, 1.49)
Below low income cut-off	43.7	(35.7, 51.7)	1.31	(0.81, 2.11)
Employment status				
Full time	34.7	(27.9, 41.4)	1.00	
Part time	15.8	(10.3, 21.3)	1.03	(0.53, 2.00)
Student	27.5	(20.5, 34.5)	0.94	(0.53, 1.66)
Other	22.1	(15.3, 28.8)	0.84	(0.42, 1.70)
Underhoused or homeless	17.4	(11.5, 23.3)	1.26	(0.75, 2.11)
Current sex work	2.2	(0.0, 4.6)	2.36 [*]	(1.33, 4.18)
Depressive symptoms				
Mean (range = 0–60)	23.2	(20.9, 25.4)	–	–
75th versus 25th percentile	–		1.19	(0.85, 1.65)

^{*} = p < 0.05.

heavy drinking once a week or more (11.1% and 10.8% respectively). Transfeminine persons had a higher HED prevalence than female (SPD = 10.1%; 95% CI: 0.9, 19.5; p = 0.033), but not male Ontarians (SPD = –6.4%; 95% CI: –15.7, 2.9; p = 0.177), age-standardized to the transfeminine age distribution. Transmasculine persons were 2.7 times more likely to report HED than the age-standardized female population (SPD = 26.5%; 95% CI: 16.5, 36.5; p < 0.000). In addition, the higher HED prevalence among transmasculine individuals as compared to Ontario males approached statistical significance (SPD = 9.8%; 95% CI: –0.2, 19.8; p = 0.055).

Weighted frequencies for socio-demographic characteristics and their bivariate and adjusted associations with HED are displayed in Table 1. In crude and adjusted sociodemographic models,

transmasculine gender remained associated with greater HED (APR = 1.82; 95% CI: 1.09, 3.06). No other sociodemographic characteristics were associated with HED.

Weighted frequencies for potential predictors of HED and their bivariate associations are presented in Table 2, while results of blockwise regression analyses are presented in Table 3. All multivariable models in Table 3 were adjusted for age and gender spectrum. Across models 1–4, the magnitude and statistical significance of the APR for gender spectrum varied little from the initial adjusted value in Table 1 (results not shown; APRs ranged from 1.70–1.87, p-values from 0.01–0.03). This indicates that gender variation in heavy episodic drinking was not attributable to differences in transition and social exclusion between gender spectra.

Table 3

Blockwise logistic regression predicting past-year heavy episodic drinking among transgender people in Ontario, Canada (n = 397).

	Adjusted prevalence ratios ^a							
	Model 1		Model 2		Model 3		Model 4	
	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)	PR	(95% CI)
Living full-time in felt gender	1.09 [†]	(0.65, 1.83)	–	–	–	–	–	–
Medical transition status								
Complete	1.00 [†]							
In process	1.02	(0.56, 1.84)						
Planning but not begun	1.37	(0.74, 2.54)						
Not planning, unsure, N/A	0.95	(0.43, 2.09)						
Transphobia: 75th versus 25th percentile	–		0.80	(0.57, 1.13)	0.84 [†]	(0.61, 1.16)	–	–
Transphobic assault	–		1.45	(0.97, 2.15)	1.36	(0.89, 2.09)	1.15	(0.76, 1.74)
Social support: 75th versus 25th percentile	–		0.90 [†]	(0.65, 1.26)	–	–	–	–
Strong parental support for gender	–		0.89 [†]	(0.54, 1.49)	–	–	–	–
Below low income cut-off	–		1.18 [†]	(0.70, 1.97)	–	–	–	–
Employment status								
Full time		1.00 [†]						
Part time	–		0.94	(0.52, 1.69)	–	–	–	–
Student		0.78		(0.45, 1.38)				
Other		0.81		(0.42, 1.56)				
Underhoused or homeless	–		1.19 [†]	(0.69, 2.04)	–	–	–	–
Current sex work	–		–		2.19 [*]	(1.33, 3.60)	2.19 [*]	(1.33, 3.61)
Depressive symptoms: 75th versus 25th percentile	–		–		–		1.16	(0.86, 1.57)
Nagelkerke R ²	0.07		0.10		0.08		0.09	

^a All models control for age and gender spectrum.[†] p > 0.25, not included in subsequent models.^{*} = p < 0.05.

In crude and adjusted analyses, current sex workers had an approximately two-fold higher HED prevalence (APR in final model = 2.19, 95% CI: 1.36, 3.55). Neither transition status nor social exclusion/inclusion variables were associated with HED.

4. Discussion

Despite the well-established public health impacts of alcohol use in Canada and the United States, and well-documented burden of alcohol misuse in marginalized populations, little research has addressed alcohol use among transgender adults. Drawing on data generalizable to the networked trans population of Canada's most populous province, we found that the estimated prevalence of HED monthly or more (33.2%) exceeded what would be expected based on the age distribution of trans Ontarians, particularly in comparison to the background female population. With the exceptions of transmasculine gender identity and sex work, sociodemographic characteristics, gender transition, and social exclusion factors were not associated with HED. Transmasculine persons were more likely than transfeminine persons to engage in heavy episodic drinking at least monthly, and this effect was robust to adjustment for all other covariates in the regression models. Their HED prevalence far exceeded the age-standardized female population of Ontario, and was almost significantly higher than that of age-standardized males. This provocative finding indicates need for increased attention to the behavioural health needs of transmasculine persons, which have arguably been overshadowed to date by research and programmatic emphasis on substance use as it relates to HIV risk. The roles of gender expectations and beliefs on alcohol use and misuse among transmasculine persons are particularly worthy of further exploration. In the broader population, sex differences in alcohol use, misuse, and dependence have declined over time, but remain evident (Keyes et al., 2008). These shrinking sex differences in alcohol behaviors are hypothesized to relate to shifting social norms related to gender, and indicate that greater susceptibility to alcohol misuse among cisgender males cannot be solely attributed to biological factors. Our findings similarly indicate that gender identity and lived gender play a large role in alcohol misuse among trans people.

That gender disparities in the cisgender population are larger for heavy drinking behavior than for alcohol abuse or dependence (Keyes et al., 2008) may help to explain our finding of no gender spectrum difference in the prevalence of frequent HED (weekly or more). Occasional HED among transmasculine persons may be influenced by sociocultural beliefs that equate excessive drinking behaviour with masculinity, or alcohol use may represent a stress-coping response that is relatively socially normative for transmasculine persons.

Estimated HED prevalence among transfeminine Ontarians fell between that of the age-adjusted cisgender female and male populations, and was only significantly different from the female population prevalence. Regardless of whether alcohol use patterns are attributed to natal sex or gender socialization, we might expect transfeminine persons to demonstrate greater HED prevalence than cisgender females. The observed disparity may not, therefore, be indicative of a health inequity.

With respect to other sociodemographic characteristics, age was, unexpectedly, not significantly associated with HED within the trans population. As has been shown for sexual minorities (Hughes and Eliason, 2002), age-related declines in substance use may be less steep among trans people and therefore difficult to detect in this relatively young sample. We also did not find evidence for an effect of minority stress on HED, despite the frequency with which participants encountered transphobia, violence, and social exclusion. As some degree of exposure to transphobia is ubiquitous among trans people, we cannot conclude that minority stress does not play a role in hazardous alcohol use in this trans population. Self-reported stigma and discrimination may not contribute to intra-population variation in alcohol misuse within the trans population, yet exposure to social-structural transphobia could account for the inter-population disparities we have identified.

Finally, consistent with previous research among cisgender and transgender sex workers (Hoffman, 2014), we found that current sex work was associated with HED, despite the low frequency of sex work in this population (2.2% were current sex workers). The small number of sex workers in our study precludes exploration of specific contributors to alcohol use for this population;

however, drinking may represent a coping strategy in response to sex-work-specific stressors and one that is normative within some sex workplace cultures (Li et al., 2010).

4.1. Strengths and limitations

The Trans PULSE survey employed validated alcohol use measures, including an HED measure directly comparable with Statistics Canada data for the same time period. Our novel use of age-standardized comparison data from the Canadian Community Health Survey overcame a consistent limitation of transgender health research, in which appropriate comparison groups are often lacking. Considering that trans people (particularly transmasculine persons) are younger than the background population, comparison of unstandardized prevalence can be misleading. Bias can be compounded by comparison of population-based survey findings to results of urban, high-risk convenience samples that characterize many transgender substance use studies. In contrast, these data were obtained from across the province that contains two-fifths of Canada's population. Demographic characteristics largely mirrored the background population, with the exception of younger age and lower incomes (Bauer et al., 2012).

Nevertheless, some limitations should be noted. CCHS data were standardized to RDS-weighted point estimates for the age distributions of trans Ontarians. Were trans status ascertained in the Canadian census, such census data would be preferable for standardization. However, given that we employed standardization to make comparisons to the same population that gave rise to the estimates, this limitation is unlikely to affect results. In addition, while these RDS II analyses account for bias related to personal network size, other sampling biases may persist. Homophily, the tendency to know and recruit like others, is of concern in chain-referral sampling, and alternative RDS estimators explicitly adjust for homophily in recruitment. However, previous unpublished sensitivity analyses with this data set revealed that with the exception of geographic variables, results were not impacted substantially by the choice of estimator. Ultimately, while respondent-driven sampling represents an improvement over convenience sampling, inclusion of questions to capture transgender status in population-based surveys will be necessary to overcome these limitations.

4.2. Conclusion

We identified disparities in heavy episodic drinking between transgender and cisgender residents of Canada's most populous province, which were particularly pronounced for transmasculine persons. These results should stimulate development of public health interventions and further research to address alcohol use among transmasculine persons.

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Contributors

GRB planned and carried out the survey. AIS and GRB conceptualized the paper and designed the analyses. AIS conducted the analyses and drafted the manuscript. All authors contributed to

interpreting the results, edited the manuscript, and approved the final version.

Conflict of interest

No conflict declared.

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