Sexual orientation and alcohol-related harms in Canadian youth

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Abstract

Objectives To determine associations between experiencing alcohol-related harm, sex, and sexual orientation among Canadian high school students.

Methods We used data from the 2012 Atlantic Student Drug Use Survey (ASDUS), including a comprehensive six-category measure of sexual orientation and nine different alcohol-related harms for analyses. Simple logistic regression was used to determine the association between experiencing any of the nine harms and each specific alcohol-related harm and sexual orientation, stratified by sex. Analysis was limited to those who indicated they had consumed alcohol in the year prior to the survey.

Results High rates of having any alcohol-related harm were seen among both males (41.7%) and females (46.0%) attending Atlantic Canadian high schools. Mostly heterosexual males had a lower odds ratio for experiencing any alcohol-related harm compared to heterosexual males. Mostly heterosexual females and bisexual females had higher odds ratios for experiencing any alcohol-related harm than heterosexual females.

Conclusions High rates of alcohol-related harm in this population suggest that youth may benefit from a harm reduction approach to alcohol use. While we found that mostly heterosexual and bisexual female youth experience higher levels of alcohol-related harm than heterosexual females, further research is required to confirm this association and to determine its relevance to harm reduction strategies.

Résumé

Objectifs Déterminer les associations entre l'expérience des méfaits attribuables à la consommation d'alcool, le sexe et l'orientation sexuelle chez des élèves du secondaire canadiens.

Méthode Pour nos analyses, nous avons utilisé les données de l'édition 2012 de l'enquête sur la consommation de drogues chez les élèves dans les provinces de l'Atlantique (ASDUS), notamment un indicateur exhaustif de l'orientation sexuelle comportant six catégories et neuf types de méfaits attribuables à l'alcool. Un modèle de régression logistique simple a servi à déterminer les associations entre l'expérience d'au moins un des neuf méfaits, chaque méfait attribuable à l'alcool et chaque orientation sexuelle, stratifiées selon le sexe. Notre analyse s'est limitée aux élèves ayant dit avoir consommé de l'alcool au cours de l'année antérieure à l'enquête.

Résultats Des taux élevés d'expérience de méfaits attribuables à l'alcool ont été observés chez les garçons (41,7%) et chez les filles (46%) fréquentant les écoles secondaires du Canada atlantique. Les garçons principalement hétérosexuels ont affiché un rapport de cotes moins élevé que les garçons hétérosexuels pour ce qui est de l'expérience d'au moins un méfait attribuable à l'alcool. Les filles principalement hétérosexuelles et les filles bisexuelles ont affiché des rapports de cotes plus élevés que ceux des filles hétérosexuelles pour ce qui est de l'expérience d'au moins un méfait attribuable à l'alcool.

Conclusions Les taux élevés de méfaits attribuables à l'alcool dans cette population indiquent que les jeunes pourraient bénéficier d'une démarche de réduction des méfaits de la consommation d'alcool. Bien que nous ayons constaté que les niveaux de méfaits attribuables à

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l'alcool étaient plus élevés chez les filles principalement hétérosexuelles et les filles bisexuelles que chez les filles hétérosexuelles, il faudrait pousser la recherche pour confirmer cette association et en déterminer la pertinence pour les stratégies de réduction des méfaits.

Keywords Sexual behavior · Adolescent · Adolescent behavior · Harm reduction · Alcohol drinking · Underage drinking

Mots-clés Comportement sexuel · Adolescent · Comportement de l'adolescent · Réduction des dommages · Consommation d'alcool · Consommation d'alcool par les mineurs

Introduction

Alcohol is by far the most common substance used and abused by Canadian adolescents (Canadian Centre on Substance Abuse 2007). The 2012–2013 Youth Smoking Survey found that 60% of Canadian students in grades 10–12 had tried alcohol and that 46% had engaged in binge drinking at least once in the previous 12 months (Health Canada 2015). For most adolescents, alcohol use is occasional or experimental; however, though their alcohol use, some will harm their current or future health, and may also threaten the well-being of others (Canadian Centre on Substance Abuse 2007). These consequences are herein referred to as alcohol-related harms.

Alcohol-related harms among young people include, but are not limited to, sexual risk taking, poor academic performance, violence, conflict, and injuries (Patrick et al. 2012). The 2004 Canadian Addiction Survey found that one fifth of drinkers aged 15–24 years experienced at least one form of harm due to their drinking in the previous year (Health Canada 2005). Alcohol, along with tobacco and illicit drug use, contributes to 21% of all deaths, 25% of potential life years lost and 19% of days spent in hospital for those aged 15 years or more in Canada (Rehm et al. 2006). Though tobacco use accounts for the largest proportion of each of these outcomes when considering all ages, alcohol accounts for a much larger burden of acute harms (such as those from accidents and injuries) in younger age groups (Rehm et al. 2006). The demonstrated impact of alcohol and its related harms on the well-being of young Canadians warrants a thorough investigation of which subpopulations are most affected.

Sexual orientation describes an individual's sexual, psychological and emotional feelings of attraction toward others, sexual identity, and sexual behaviour. Sexual attraction exists along a continuum, ranging from being attracted to only the opposite sex, to being attracted to only the same sex (Public Health Agency of Canada 2010). Between 2% and 10% of individuals in North America are of non-heterosexual orientation (Birkett et al. 2009). Sexual orientation and substance use have previously been linked in the literature among young people. A meta-analysis of substance use and sexual orientation concluded that lesbian, gay, and bisexual (LGB) teens from several countries, including the USA, Australia and Canada had 2.9 times higher odds of being engaged in any substance use than their heterosexual counterparts. The odds of any substance use were 340%

higher for bisexual youth (of both genders) and 400% higher for non-heterosexual female youth (Marshal et al. 2008).

Though some studies have described risk and protective factors for alcohol-related harms, few have examined high school students, and only one focused on sexual orientation in this population (Homma et al. 2012). This study, conducted by Homma et al. in 2012 (Homma et al. 2012), examined the relationship between experiencing at least one alcohol-related harm and sexual orientation among East and Southeast Asian adolescents in British Columbia, Canada. Homma et al. (2012) focused on the group of adolescents who identified as “mostly heterosexual”—one of the most commonly reported sexual identities of young adults (Savin-Williams and Vrangalova 2013). Mostly heterosexual female students were found to be more likely than their heterosexual counterparts to experience any harm from alcohol or drugs (odds ratio (OR) = 2.09; 99% confidence interval (CI) = 1.73–2.52). A recent review also found that females across a broad age range who identify as mostly heterosexual reported more mental health and substance use problems than their completely heterosexual counterparts, though the literature on mostly heterosexual and mostly homosexual identities remains sparse for many outcomes among adolescents (Vrangalova and Savin-Williams 2014).

While Homma et al. (2012) took an important step by investigating the association between sexual orientation and harm, there are many areas to build upon for future research on this topic. First, those of East and Southeast Asian descent represent only 8% of the total Canadian population, meaning that the study findings may not be generalizable to the diverse Canadian adolescent population (Statistics Canada 2011). Their study also did not investigate specific harms that may have contributed to the overall association. Finally, homosexual and bisexual students were combined in one group, despite the fact that bisexual youth have higher prevalence of substance use and may experience different patterns of alcohol-related harm (Marshal et al. 2008; Duryea and Frantz 2011).

In 2011, Duryea and Frantz examined several specific consequences of drinking by sexual orientation in a national sample of college students in the USA (Duryea and Frantz 2011). Bisexual and heterosexual males, while under the influence of alcohol, were both significantly more likely to injure others and fight than their homosexual counterparts, whereas bisexual

females were more likely to injure others and have unprotected sex than their heterosexual counterparts. Previous studies have found that individuals with attractions to both sexes reported higher levels of internalized homonegativity (Cox et al. 2010), were less open about their sexual orientation than lesbian or gay individuals (Balsam and Mohr 2007), and had lower levels of LGB community involvement (Cox et al. 2010; Balsam and Mohr 2007). Duryea and Frantz suggest that bisexual individuals (women in particular) may be more vulnerable to harmful substance use as a stress-coping mechanism, as posited through Meyer's Minority Stress Model (Duryea and Frantz 2011; Meyer 2003). Generalizing study findings in college students to high school students is problematic due to differing cultures surrounding alcohol in each environment (Gliksman et al. 2003). Furthermore, these findings cannot be generalized from the USA to Canada due to differing alcohol policies, most notably differing legal drinking ages (Keller et al. 2009).

Studying the characteristics of adolescents who experience harm due to their alcohol consumption should be a public health priority, in order to develop targeted interventions to decrease morbidity and mortality at an early age. The current study seeks to build on the work of Homma et al. (2012) and Duryea and Frantz (2011) by determining whether sexual orientation is associated with experiencing (a) any alcohol-related harm and (b) specific alcohol-related harms among high school students. This study addresses gaps in the literature by using a more nuanced measure of sexual orientation, specific alcohol-related harms, and a representative sample of high school students.

Methods

Survey instrument

The current study examines cross-sectional associations between sex, sexual orientation, and alcohol-related harms using data from the 2012 Atlantic Student Drug Use Survey (ASDUS). The 2012 ASDUS was a standardized survey conducted in collaboration with the governments of Nova Scotia (NS), New Brunswick (NB), and Newfoundland and Labrador (NL). This self-completion survey consisted of 106 multiple-choice items and one open-ended feedback question. The Dalhousie University Health Sciences Research Ethics Board granted ethical approval for the survey. Paper-based surveys were completed in English or French, depending on the primary language of school instruction. Responses to all questions were self-reported. More detailed information concerning the survey design and methods can be found in the Nova Scotian provincial report (Asbridge and Langille 2013).

The primary ASDUS sample consisted of students in grades 7, 9, 10, and 12 in the public school systems in the three participating provinces. A two-stage stratified cluster sample was drawn. First, schools were randomly selected

from within each of the four Shared Service Areas (SSA) in NS, four School Districts in NL, and seven Health Districts in NB. In the second stage, classes containing over 20 students (in one of the four surveyed grades) were randomly selected. The sample allowed for approximately proportional representation of each region and each grade. Data were weighted subsequently in order to correct for the overall disproportionate sampling strategy and for survey non-response, to produce estimates reflective of the province's whole student population. A total of 9226 Atlantic Canadian randomly selected students in grades 7, 9, 10, and 12 completed the questionnaire, with an overall response rate of over 90% of students present on the day of the survey.

Study sample

Students in grade 7 ($n = 2369$) were excluded from the current analysis, which focused on high school students who are typically defined as students in grades 9–12. Alcohol use is also low in grade 7 students in NS, with only 3.6% reporting alcohol use more than once per month, compared to 21.5, 30.4, and 47.9% of students in grades 9, 10, and 12, respectively (Asbridge and Langille 2013). Finally, students in grade 7 are typically in the “early adolescence” developmental period. More clearly defined sexual orientation and stronger emphasis on peer groups tend to emerge during middle adolescence (approximately 15–16 years of age) and late adolescence (approximately 17–21 years of age) (Spano 2004).

Students who did not report any past-year history of alcohol consumption were also excluded from analyses ($n = 1577$), as alcohol consumption is a prerequisite for directly propagating or experiencing the harms of interest. Respondents missing sex or sexual orientation information were also excluded from analyses ($n = 216$). Finally, the responses of all students who reported using a fictitious drug were excluded ($n = 68$). This question was included in the survey to detect students not responding in an honest fashion.

Measures

Alcohol-related harms

The ASDUS collected information on nine consequences related to alcohol consumption, all assessed over the past 12 months. These alcohol-related harms are the following:

- Alcohol affecting school work and/or exams
- Alcohol causing tensions or disagreements with family
- Trouble with the police due to drinking
- Money spent on alcohol causing one to give up buying other things
- Consuming alcohol before breakfast

- Damage to property under the influence of alcohol
- Injuring oneself under the influence of alcohol
- Unplanned sex under the influence of alcohol or drugs
- Driving under the influence of alcohol (with or without a collision)

Eight of the nine harms were assessed as “no” or “yes.” Driving under the influence was assessed by frequency (never to three or more times) and was recoded to no or yes.

We created a composite outcome variable to reflect experiencing at least one of these harms compared to students who reported that they had not experienced any of these harms. Students who did not respond to one or more of these items and who did not report any of the other harms were excluded from this analysis, due to the inability to ascertain their status with respect to such harms ($n = 164$).

Independent variables

Certain alcohol-related harms have previously been shown to occur disproportionately by sex and sexual orientation in college samples (Duryea and Frantz 2011). Sex was assessed in the ASDUS by asking the following question: “Are you male or female?”

Sexual orientation can be challenging to measure in surveys, with sexual behaviours, identity, and attraction to be considered (Korchmaros et al. 2013). Where it is necessary to use a single measure of sexual orientation, using an attraction measure is likely to capture the highest number of students of non-heterosexual orientation, and thus the highest number who may be at risk. Some students may not yet have engaged in sexual behaviour, and some may not yet be comfortable with self-labelling as having a non-heterosexual identity (Saewyc et al. 2004). Another study found that questions on sexual attraction are most consistently understood by youth, and that most youth preferred a sexual orientation item that provided the intermediate options mostly heterosexual and mostly homosexual to represent feeling between categories (Austin et al. 2007).

Sexual orientation was measured with the following question, measuring sexual attraction (question 87): “People have different feelings about themselves when it comes to questions of being attracted to other people. Which of the following best describes your feelings?” The following six response options were provided: “100% heterosexual (attracted to persons of the opposite sex),” “mostly heterosexual,” “bisexual (attracted to both males and females),” “mostly homosexual,” “100% homosexual (gay/lesbian; attracted to persons of the same sex),” and “not sure.” Sexual orientation was treated as a categorical variable for analyses (coded 1 to 6). This measure reflected the attraction component of one’s sexual orientation (Saewyc et al. 2004).

Statistical analyses

Respondents with missing data related to the primary outcomes and exposures of interest were excluded from related analyses. All data were analyzed using Stata V.13.1 (StataCorp, College Station, TX) software. Significance levels were set at $\alpha = 0.05$. All analyses used probability weights to take into account the stratified disproportionate cluster sample design and were stratified by sex. In all analyses, heterosexual orientation was the referent category.

The sample was described in relation to sexual orientation and all measures of alcohol-related harm using unweighted frequencies and weighted proportions. Logistic regression was used to estimate the associations between sexual orientation and experiencing any alcohol-related harm. Finally, associations between sexual orientation and specific harms were examined. Only harms with over 10% prevalence in the study sample were examined to ensure sufficient statistical power.

Results

All results are reported among youth in grades 9, 10, and 12 who reported consuming alcohol in the past year and who had complete data related to outcomes and exposure variables of interest (the study sample). As shown in Table 1, mostly heterosexual was the most common non-heterosexual orientation among both males (3.6%) and females (9.9%) in our study sample ($n = 4996$). Mostly homosexual was the least prevalent non-heterosexual orientation in the study sample, with 0.7% of males and 0.6% of females reporting such an orientation. The study sample was 47.2% male, with 88.6% of males and 79.6% of females reporting heterosexual sexual orientation.

Table 2 presents ORs for the association between sexual orientation and experiencing at least one alcohol-related harm over the past year ($n = 4832$). Mostly heterosexual males were less likely than heterosexual males to experience any alcohol-related harm over the past year (OR = 0.54; 95% CI 0.30–0.98). Conversely, mostly heterosexual females were more likely than heterosexual females to experience any alcohol-related harm over the past year (OR = 1.39; 95% CI 1.04–1.86). Bisexual females were also more likely to experience any harm than their heterosexual counterparts over the past year (OR = 1.52; 95% CI 1.00–2.32).

As shown in Table 3, almost half of females (46.0%) and 41.7% of males in our study sample reported experiencing at least one alcohol-related harm over the past year. For males, harms with over 10% prevalence were damage to property (17.8%), self-injury (16.3%), driving under the influence (10.1%), and unplanned sex under the influence of alcohol or drugs (19.0%) (Table 3). For females, harms with over 10% prevalence were tensions or disagreements with family and/or friends (11.6%), affected spending (14.2%), damage to

Table 1 Sexual orientation of students in grades 9, 10, and 12 who had consumed alcohol in the past year, unweighted frequencies and weighted percentages with 95% CI in parentheses ($n = 4996$)

Sexual orientation	Males ($n = 2359$)		Females ($n = 2637$)	
	Unweighted frequency	Weighted percentage (95% CI)	Unweighted frequency	Weighted percentage (95% CI)
100% heterosexual	2092	88.6 (86.8–90.1)	2110	79.6 (76.9–82.1)
Mostly heterosexual	82	3.6 (2.7–4.9)	250	9.9 (8.2–11.9)
Bisexual	58	3.1 (2.0–4.8)	170	6.8 (5.5–8.4)
Mostly homosexual	19	0.7 (0.4–1.3)	18	0.6 (0.3–1.0)
100% homosexual	27	1.2 (0.6–2.2)	22	1.2 (0.4–3.0)
Unsure	81	2.8 (2.1–3.6)	67	1.9 (1.5–2.6)

property (14.6%), self-injury (20.2%), and unplanned sex under the influence of alcohol or drugs (22.7%) (Table 3).

Compared to heterosexual males, mostly heterosexual males were less likely to drive under the influence of alcohol (OR = 0.24; 95% CI 0.09–0.69) and engage in unplanned sex under the influence of alcohol or drugs (OR = 0.27; 95% CI 0.12–0.60) (Table 4). Compared to heterosexual females, mostly heterosexual females were more likely to experience tensions or disagreements with family (OR = 1.91; 95% CI 1.22–3.01) and injure themselves while drinking (OR = 1.50; 95% CI 1.00–2.25) (Table 5). Bisexual females were more likely to engage in unplanned sex while under the influence of alcohol or drugs than their heterosexual counterparts (OR = 1.62; 95% CI 1.04–2.53).

Discussion

Mostly heterosexual was the most prevalent non-heterosexual orientation in our sample of Atlantic Canadian high school drinkers among both males (3.6%) and females (9.9%). Despite this finding, and the fact that other studies have identified this orientation as common, the literature surrounding the health behaviours of those who identify as mostly heterosexual identity is sparse, especially in the case of males

(Homma et al. 2012; Savin-Williams and Vrangalova 2013; Vrangalova and Savin-Williams 2014).

We found differences in the risk of alcohol-related harms between students who identified as heterosexual and students who identified as mostly heterosexual, among both males and females. Mostly heterosexual males were less likely to report any harm than heterosexual males; this association was largely due to the lower likelihood of heterosexual males driving or engaging in unplanned sex while under the influence. Homma et al. found no significant difference in the odds of experiencing one or more problems related to drug or alcohol use between heterosexual and mostly heterosexual males, though this was within a specific ethnic group (Homma et al. 2012). One of the hypotheses as to why heterosexual males may be at higher risk for alcohol-related harms than non-heterosexual males relates to social norms around masculinity (Iwamoto et al. 2012). A pressure on heterosexual males to conform to masculine gender norms can impact several health behaviours related to alcohol, including misuse and physical fighting (Mahalik et al. 2007). One study found that masculine norms of heterosexual display were also related to alcohol use through susceptibility to peer pressure among young males (Iwamoto and Smiler 2013). Heterosexual males may feel a need to prove their masculinity to their peers, leading to displays of traditional masculinity (e.g., fighting, risk taking) under the influence of alcohol.

Table 2 Weighted percentage and odds ratio (with 95% CI) for experiencing any alcohol-related harms among students in grades 9, 10, and 12 who had consumed alcohol in the past year, by sex and sexual orientation

Sexual orientation	Males ($n = 2359$)		Females ($n = 2637$)	
	Weighted percentage (%)	Odds ratio (with 95% CI)	Weighted percentage (%)	Odds ratio (with 95% CI)
Heterosexual	41.7	1.00 (–)	45.1	1.00 (–)
Mostly heterosexual	28.1	0.54 (0.30–0.98)*	53.3	1.39 (1.04–1.86)*
Bisexual	53.4	1.61 (0.68–3.80)	55.6	1.52 (1.00–2.32)*
Mostly homosexual	57.4	1.88 (0.57–6.18)	42.3	0.89 (0.30–2.64)
100% homosexual	41.0	0.97 (0.29–3.25)	17.8	0.26 (0.06–1.18)
Unsure	40.4	0.94 (0.53–1.69)	30.1	0.52 (0.27–1.03)

* $p < 0.05$

Table 3 Past 12-month experiences with specific alcohol-related harms among students in grades 9, 10, and 12 who had consumed alcohol in the past year by sex, unweighted frequencies, and weighted percentages (95% CI)

Alcohol-related harm	Males		Females	
	Unweighted frequency	Weighted percentage (95% CI)	Unweighted frequency	Weighted percentage (95% CI)
Affected schoolwork or exams	72	2.9 (2.2–3.8)	74	2.6 (1.9–3.5)
Tensions or disagreements with family and/or friends	187	7.6 (6.2–9.4)	307	11.6 (10.0–13.4)†
Trouble with police	108	4.7 (3.7–6.1)	63	2.6 (1.9–3.6)
Affected ability to buy other things	210	8.9 (7.2–11.0)	337	14.2 (12.3–16.4)†
Consumed alcohol before breakfast	233	8.5 (7.1–10.1)	194	7.0 (5.8–8.5)
Damaged property	406	17.8 (15.8–20.0)†	344	14.6 (12.4–17.0)†
Injured oneself	355	16.3 (13.8–19.1)†	475	20.2 (17.7–22.9)†
Drove a motor vehicle under the influence	296	10.1 (8.4–12.0)†	146	5.1 (4.0–6.4)
Unplanned sex	435	19.0 (16.9–21.3)†	544	22.7 (20.3–25.3)†
One or more harms	986	41.7 (38.5–45.0)	1135	46.0 (43.2–48.9)

The dagger indicates the following: Point estimate of proportion is above 10%, was analyzed individually for association with sexual orientation

Mostly heterosexual females, on the other hand, were more likely to experience any harm than heterosexual females. This finding is consistent with Homma et al. (2012), who suggest that mostly heterosexual females may experience increased minority stress related to a sense of not belonging to the traditional non-heterosexual orientation groups (i.e., LGB), and double minority status (female sex and non-heterosexual orientation) (Meyer 2003). This notion is supported by a recent review of sexual orientation and health where mostly heterosexual females reported more substance use, which could be a

coping mechanism to dull the symptoms of minority stress (Vrangalova and Savin-Williams 2014). In turn, the impaired-functioning model hypothesizes that using alcohol as a coping mechanism may harm personal relationships, increase the risk of accidents, and increase vulnerability to victimization (Shrier et al. 2001). Those who identify as mostly heterosexual may not be considered a traditional sexual minority, and thus may not benefit from LGB-specific health and support resources that can act as protective factors (Vrangalova and Savin-Williams 2014). It is thus of note that

Table 4 Weighted percentage and odds ratios (with 95% CI) for experiencing specific alcohol-related harms among male students in grades 9, 10, and 12 who had consumed alcohol in the past year, by sexual orientation

Alcohol-related harm	Sexual orientation					
	100% heterosexual (referent)	Mostly heterosexual	Bisexual	Mostly homosexual	100% homosexual	Unsure
Damage to property						
Percentage (%)	17.8	11.3	34.2	0.0	10.4	16.4
Odds ratio (95% CI)	1.00 (–)	0.59 (0.27–1.29)	2.40 (0.66–8.78)	–	0.54 (0.10–2.77)	0.91 (0.42–1.95)
Self-injury						
Percentage (%)	16.0	12.9	31.4	9.0	9.5	16.5
Odds ratio (95% CI)	1.00 (–)	0.78 (0.36–1.66)	2.40 (0.65–8.84)	0.52 (0.12–2.22)	0.55 (0.10–3.09)	1.03 (0.47–2.27)
Driving under the influence						
Percentage (%)	10.3	2.7	7.7	29.3	9.1	8.7
Odds ratio (95% CI)	1.00 (–)	0.24 (0.09–0.69)*	0.73 (0.28–1.89)	3.60 (0.82–15.9)	0.87 (0.17–4.32)	0.83 (0.35–1.95)
Unplanned sex						
Percentage (%)	19.5	6.2	28.1	16.1	29.0	7.5
Odds ratio (95% CI)	1.00 (–)	0.27 (0.12–0.60)*	1.62 (0.35–7.48)	0.79 (0.21–2.99)	0.79 (0.21–2.99)	0.34 (0.11–1.07)

* $p < 0.05$

Table 5 Weighted percentage and odds ratios (with 95% CI) for experiencing specific alcohol-related harms among female students in grades 9, 10, and 12 who had consumed alcohol in the past year, by sexual orientation

Alcohol-related harm	Sexual orientation					
	100% heterosexual (referent)	Mostly heterosexual	Bisexual	Mostly homosexual	100% homosexual	Unsure
Tensions or disagreements						
Percentage (%)	10.6	18.5	15.6	10.7	4.1	8.0
Odds ratio (95% CI)	1.00 (–)	1.91 (1.22–3.01)*	1.66 (0.90–2.68)	1.01 (0.13–7.81)	0.36 (0.04–3.27)	0.73 (0.17–3.05)
Money lost						
Percentage (%)	14.3	16.9	11.8	19.7	6.2	8.4
Odds ratio (95% CI)	1.00 (–)	1.21 (0.72–2.05)	0.80 (0.42–1.50)	1.47 (0.37–5.77)	0.39 (0.04–3.89)	0.55 (0.22–1.37)
Damage to property						
Percentage (%)	14.3	14.1	22.2	15.6	6.9	4.9
Odds ratio (95% CI)	1.00 (–)	0.98 (0.59–1.62)	1.70 (0.99–2.92)	1.10 (0.23–5.22)	0.44 (0.10–1.93)	0.31 (0.09–1.05)
Self-injury						
Percentage (%)	19.3	26.4	24.6	20.2	15.9	10.7
Odds ratio (95% CI)	1.00 (–)	1.50 (1.00–2.25)*	1.36 (0.81–2.27)	1.06 (0.27–4.10)	0.79 (0.16–3.80)	0.50 (0.15–1.66)
Unplanned sex						
Percentage (%)	22.1	24.3	31.6	16.5	13.6	12.8
Odds ratio (95% CI)	1.00 (–)	1.13 (0.72–1.75)	1.62 (1.04–2.53)*	0.69 (0.16–2.97)	0.55 (0.11–2.80)	0.52 (0.22–1.23)

* $p < 0.05$

significantly higher levels of tensions and disagreements with family or friends and self-injury contributed to overall associations with alcohol-related harm among mostly heterosexual females compared to heterosexual females.

Finally, we found that bisexual females had slightly higher odds of experiencing any harm compared to heterosexual females. This was largely driven by the specific harm of engaging in sex under the influence of alcohol and drugs. Duryea and Frantz (2011) observed a higher mean count of alcohol-related harms among young bisexual American college students compared to their heterosexual counterparts, a population somewhat different from the high school students in our survey. Some of the heightened risk among bisexuals in that study could possibly be attributed to the fact that mostly heterosexual identity was not considered. McCabe et al. (2012), studying sexual identity and substance use among university students, found that one third of female students who identified as bisexual in a three-category measure of sexual orientation went on to identify as mostly heterosexual in a five-category measure (McCabe et al. 2012).

Furthermore, McCabe et al. found that many of the individuals who identified as “mostly heterosexual” in the five-category sexual identity measure selected “heterosexual” in a three-category measure (McCabe et al. 2012). By using a three-category measure, a group of youth who may be at higher risk of substance use (mostly heterosexual) will be also be masked among heterosexual youth. Mostly heterosexual individuals should be treated as a separate group in studies examining alcohol and sexual orientation, due not only to

the size of this group but also as we have demonstrated, because of the potential for differing experiences with alcohol-related harms.

This study is the first of its nature in an Atlantic Canadian high school population and has several strengths, such as a high response rate (> 90%) and overall sample size. Students of a range of sexual orientations were drawn from the same sample population, a strength that is not often seen in the substance abuse literature where nonprobability samples are frequent (Meyer 2003). Furthermore, this study examined differences between multiple surveyed categories of sexual orientation, rather than amalgamating all those of non-heterosexual orientation. Grouping distinct non-heterosexual orientations together for analysis was a clear weakness in the literature (Duryea and Frantz 2011). This study was not without limitations, including the use of cross-sectional data, which did not allow us to infer causal relationships. Cross-sectional self-reported survey data also presents the risk of several types of bias, including social desirability bias, which may have impacted participants’ willingness to report non-heterosexual orientation or alcohol-related harms (Kaminska and Foulsham 2013). Despite using a more comprehensive measure of sexual orientation than most studies, ours did not include sexual orientations such as “asexual,” and gender identities such as “transgender.” Differences in the odds of alcohol-related harms between heterosexual respondents, and some subcategories of non-heterosexual respondents were perhaps difficult to establish due to small cell sizes and thus low statistical power. Particular categories of concern are

those of mostly homosexual orientation (both males and females), who have not yet been studied in detail in the literature. The ASDUS did not include a direct measure of minority stress, and we were thus unable to test the theory that higher rates of harm among non-heterosexual youth may be related to coping with minority stressors. Future studies should explore this concept, to determine how experiences with minority stress impact experiences with alcohol-related harms.

Our study found that over 40% of Atlantic Canadian high school students who drank experienced at least one alcohol-related harm over the past year. These high levels of harm suggest the need for prevention programs focused on harm reduction (Poulin 2006). Higher odds of experiencing alcohol-related harms among bisexual and mostly heterosexual females compared to heterosexual females are important to consider when developing harm reduction strategies. Our study has also identified specific harms that may warrant targeting in harm reduction strategies based on sex and sexual orientation.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

References

- Asbridge, M., & Langille, D. B. (2013). *Nova scotia student drug use survey: technical report*. NS: Halifax.
- Austin, S., Conron, K., Patel, A., & Freedner, N. (2007). Making sense of sexual orientation measures: findings from a cognitive processing study with adolescents on health survey questions. *Journal of LGBT Health Research*, 3(1), 55–65.
- Balsam, K. F., & Mohr, J. J. (2007). Adaptation to sexual orientation stigma: a comparison of bisexual and lesbian/gay adults. *J Couns Psychol*, 54(3), 306–319. <https://doi.org/10.1037/0022-0167.54.3.306>.
- Birkett, M., Espelage, D. L., & Koenig, B. (2009). LGB and questioning students in schools: the moderating effects of homophobic bullying and school climate on negative outcomes. *Journal of Youth and Adolescence*, 38(7), 989–1000. <https://doi.org/10.1007/s10964-008-9389-1>.
- Canadian Centre on Substance Abuse (2007). *Substance Abuse in Canada: Youth in Focus* (pp. 49). Ottawa, ON: Canadian Centre on Substance Abuse.
- Cox, N., vanden Berghe, W., Dewaele, A., & Vincke, J. (2010). Acculturation strategies and mental health in gay, lesbian, and bisexual youth. *Journal of Youth and Adolescence*, 39, 1199–1210. <https://doi.org/10.1007/s10964-009-9435-7>.
- Duryea, D. G., & Frantz, T. T. (2011). An examination of drinkers' consequences by sexual orientation. *J Am Coll Heal*, 59(7), 649–654.
- Gliksmann, L., Adlaf, E. M., & Newton-Taylor, B. (2003). Heavy drinking on Canadian campuses. *Canadian Journal of Public Health*, 94(1), 17–21.
- Health Canada (2005). Canadian addiction survey: a national survey of Canadian' use of alcohol and other drugs. Ottawa.
- Health Canada (2015). Summary of results of the youth smoking survey 2012–2013. Ottawa; 2014. http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_survey-sondage_2012-2013/result-eng.php. Accessed March 20.
- Homma, Y., Chen, W., Poon, C. S., & Saewyc, E. M. (2012). Substance use and sexual orientation among East and Southeast Asian adolescents in Canada. *Journal of Child and Adolescent Substance Abuse*, 21(1), 32–50. <https://doi.org/10.1080/1067828X.2012.636687>.
- Iwamoto, D. K., & Smiler, A. P. (2013). Alcohol makes you macho and helps you make friends: the role of masculine norms and peer pressure in adolescent boys' and girls' alcohol use. *Substance Use and Misuse*, 48(5), 371–378. <https://doi.org/10.3109/10826084.2013.765479>.
- Iwamoto, D. K., Cheng, A., Lee, C. S., Takamatsu, S., & Gordon, D. (2012). "Man-ing" up and getting drunk: the role of masculine norms, alcohol intoxication and alcohol-related problems among college men. *Addictive Behaviors*, 36(9), 906–911. <https://doi.org/10.1016/j.addbeh.2011.04.005>.
- Kaminska, O., Foulsham, T. (2013). Understanding sources of social desirability bias in different modes: evidence from eye-tracking (Working Paper Series No. 2013-04). *Institute for Social & Economic Research*. Retrieved from: <https://www.iser.essex.ac.uk/publications/working-papers/iser/2013-04>
- Keller, A., Frye, L., Bauerle, J., & Turner, J. C. (2009). Legal ages for purchase and consumption of alcohol and heavy drinking among college students in Canada, Europe, and the United States. *Substance Abuse*, 30(3), 248–252. <https://doi.org/10.1080/08897070903041228>.
- Korchmaros, J. D., Powell, C., & Stevens, S. (2013). Chasing sexual orientation: a comparison of commonly used single-indicator measures of sexual orientation. *Journal of Homosexuality*, 60, 596–614. <https://doi.org/10.1080/00918369.2013.760324>.
- Mahalik, J. R., Burns, S. M., & Syzdek, M. (2007). Masculinity and perceived normative health behaviors as predictors of men's health behaviors. *Social Science and Medicine*, 64(11), 2201–2209. <https://doi.org/10.1016/j.socscimed.2007.02.035>.
- Marshal, M. P., Friedman, M. S., Stall, R., et al. (2008). Sexual orientation and adolescent substance use: a meta-analysis and methodological review. *Addiction*, 103, 546–556. <https://doi.org/10.1111/j.1360-0443.2008.02149.x>.
- McCabe, S. E., Hughes, T. L., Bostwick, W., Morales, M., & Boyd, C. J. (2012). Measurement of sexual identity in surveys: implications for substance abuse research. *Archives of Sexual Behavior*, 41, 649–657. <https://doi.org/10.1007/s10508-011-9768-7>.
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. *Psychological Bulletin*, 129(5), 674–697. <https://doi.org/10.1037/0033-2909.129.5.674>.
- Patrick, M. E., Wightman, P., Schoeni, R. F., & Schulenberg, J. E. (2012). Socioeconomic status and substance use among young adults: a comparison across constructs and drugs. *Journal of Studies on Alcohol and Drugs*, 73(5), 772–782. <https://doi.org/10.15288/JSAD.2012.73.772>.
- Poulin, C. (2006). Harm reduction policies and programs for youth. Ottawa, ON: Canadian Centre on Substance Abuse.
- Public Health Agency of Canada (2010). Sexual orientation in schools. Ottawa.
- Rehm, J., Baliunas, D., Brochu, S., Fischer, B., Gnam, W., Patra, J., Popova, S., Samocinska-Hart, A., Taylor, B. (2006). The costs of substance abuse in Canada 2002: highlights. Ottawa, ON: Canadian Centre on Substance Abuse.

- Saewyc, E. M., Bauer, G. R., Skay, C. L., et al. (2004). Measuring sexual orientation in adolescent health surveys: evaluation of eight school-based surveys. *Journal of Adolescent Health*, 35, 1–15. <https://doi.org/10.1016/j.jadohealth.2004.06.002>.
- Savin-Williams, R. C., & Vrangalova, Z. (2013). Mostly heterosexual as a distinct sexual orientation group: a systematic review of the empirical evidence. *Developmental Review*, 33(1), 58–88. <https://doi.org/10.1016/j.dr.2013.01.001>.
- Shrier, L. A., Harris, S. K., Sternberg, M., & Beardslee, W. R. (2001). Associations of depression, self-esteem, and substance use with sexual risk among adolescents. *Preventive Medicine (Baltimore)*, 33(3), 179–189. <https://doi.org/10.1006/pmed.2001.0869>.
- Spano, S. (2004) Stages of adolescent development. ACT for Youth Upstate Center of Excellent Research Facts and Findings. Ithaca, NY: Cornell University Family Life Development Center. <http://www.human.cornell.edu/actforyouth>.
- Statistics Canada (2011). National household survey: data tables. <http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/dt-td/Rp-eng.cfm?LANG=E&APATH=3&DETAIL=0&DIM=0&FL=A&FREE=0&GC=0&GID=0&GK=0&GRP=0&PID=105396&PRID=0&PTYPE=105277&S=0&SHOWALL=0&SUB=0&Temporal=2013&THEME=95&VID=0&VNAMEE=&VNAMEF>. Published 2013. Accessed 3 Sept 2015.
- Vrangalova, Z., & Savin-Williams, R. C. (2014). Psychological and physical health of mostly heterosexuals: a systematic review. *Journal of Sex Research*, 51(4), 410–455. <https://doi.org/10.1080/00224499.2014.883589>.