

# Are alcohol-related disparities between sexual minority and heterosexual youth decreasing?

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## ABSTRACT

**Background and Aims** Although sexual orientation-related alcohol use disparities are well established, researchers have not identified whether disparities are diminishing as societal attitudes towards lesbian/gay and bisexual (LGB) people become more accepting. We examined changes in four alcohol-related disparities between heterosexual and LGB youth from 1998 to 2013 by (1) estimating the prevalence of these behaviors; (2) estimating disparities in alcohol-related outcomes between heterosexual and LGB youth within each wave year; and (3) testing whether the degree of difference in alcohol-related disparities between heterosexual and LGB youth has changed. **Design** Logistic regression models and year  $\times$  sexual orientation interactions with repeated, cross-sectional, provincially representative data. **Setting** British Columbia, Canada. **Participants** Students (ages 12–19) from the 1998 ( $n = 22\,858$ ), 2003 ( $n = 29\,323$ ), 2008 ( $n = 25\,254$ ) and 2013 ( $n = 21\,938$ ) British Columbia Adolescent Health Survey (total  $n = 99\,373$ , 48.7% male, mean age = 14.84). **Measurements** We modeled age-adjusted differences in life-time alcohol use, age of onset, past 30-day drinking and past 30-day heavy episodic drinking between heterosexual and three subgroups of sexual minority youth (i.e. mostly heterosexual, bisexual and lesbian/gay). **Findings** Generally, alcohol use declined for all youth, although less so among LGB youth [average adjusted odds ratio (aOR) = 0.58 and aOR = 0.53 for heterosexual males and females and aOR = 0.71 and aOR = 0.57 for sexual minority males and females, respectively]. Within-year comparisons demonstrated elevated rates of alcohol use among LGB compared with heterosexual youth for each of the four survey years, especially among females. Findings indicate few changes over time; however, results show an increase in risky alcohol use from 1998 to 2013 among mostly heterosexual (aOR = 1.58 for life-time alcohol use, aOR = 1.58 for 30-day alcohol use and aOR = 1.34 for 30-day heavy episodic drinking), and bisexual (aOR = 1.95 for life-time alcohol use) females. **Conclusion** Despite the general decline in the prevalence of alcohol use among young people in Canada since 1998, lesbian/gay and bisexual youth in Canada continue to show elevated rates of alcohol use compared with heterosexual youth.

**Keywords** Adolescents, alcohol, disparities, LGB, school health surveys, sexual minority.

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## INTRODUCTION

Although rates have declined in recent years [1–3], adolescent alcohol use remains a major public health concern. Youth are particularly vulnerable to alcohol-related morbidity and mortality [4,5] and patterns of heavy drinking established during adolescence can persist into adulthood [6,7], leading to long-term health consequences [8]. These concerns related to adolescent alcohol use highlight the importance of identifying those youth most at risk to help inform prevention and intervention strategies [9,10].

Sexual minority (i.e. lesbian/gay and bisexual [LGB]) youth represent an at-risk group for alcohol use and misuse during adolescence [11–13]. More than a decade of research demonstrates disproportionately high rates of alcohol use among LGB compared to heterosexual youth across multiple indicators of risk including: life-time alcohol use [14], early initiation [14,15], frequency of use [16,17], the participation in and frequency of heavy episodic drinking (HED) [14,18] and problems related to drinking [19]. Comparative studies also highlight the propensity for LGB adolescents to persist and accelerate alcohol use during

the transition to adulthood [17,20–22], a factor which may explain the higher rates of alcohol abuse and dependence among sexual minority adults [23,24].

Prior studies clearly identify sexual minority disparities in alcohol use, yet at the same time there has been unprecedented, growing social acceptance for LGB people in North America [25,26]: only 44% of US adults supported the legal recognition of marriage in 1996 compared to 68% in 2016 [27]. Laws and policies protecting the rights of LGB youth and adults have also been instituted in Canada [28] and in various states across the United States [29,30], although specific anti-discrimination laws that enumerate sexual orientation have yet to receive federal US recognition. Considering the link between anti-LGB attitudes and increased alcohol use among sexual minority youth [31–33], we hypothesize that these trends in LGB acceptance could lead to a decrease in alcohol-related disparities between sexual minority and heterosexual youth. Although researchers have started to document trends in LGB health disparities over time [34], studies have yet to examine whether trends in alcohol-related disparities are changing as a function of broader social acceptance and the implementation of LGB-specific protections [29].

#### Sexual identity, gender and alcohol use

Although rates of alcohol use among sexual minority youth, in general, are elevated compared to heterosexual peers, specific groups among sexual minority youth display differential risk. For example, throughout studies, disparities in alcohol use among sexual minorities are larger and more consistent for females, whereas evidence of disparities is less consistent for males [11,12,14]. One meta-analytical review demonstrated that sexual minority females had five times greater odds of substance use compared to heterosexual females: sexual minority male adolescents were 3.5 times more likely to report substance use than their heterosexual counterparts [35].

Bisexual-identified and attracted youth also appear to be at greater risk for alcohol and substance use behavior than their gay, lesbian and heterosexual peers [12,14,19]. For example, Marshal and colleagues [35] found that bisexual youth had 4.5 times the odds of engaging in substance use behavior than heterosexuals, and the size of the effect was seven times greater than that of gay/lesbian youth. Emerging studies also demonstrate risk for alcohol use among youth who question their identities or attractions [31] along with youth and adults who report 'mostly heterosexual' identities [21,36,37]. These within-group differences among sexual minority youth are important to consider in studies investigating health disparities, as they have important implications for focused prevention and intervention strategies.

#### The current study

We used a provincially representative sample of Canadian adolescents to examine trends in alcohol use and trends of alcohol-related disparities between heterosexual and three sexual minority youth subgroups: mostly heterosexual, bisexual and gay/lesbian. Our overall goal was threefold: (1) track trends in the prevalence of life-time alcohol use, age of onset, past 30-day alcohol use and past 30-day heavy episodic drinking (HED) by sexual orientation from 1998 to 2013; (2) estimate alcohol-related disparities between heterosexual and sexual minority subgroups for each survey year; and (3) test whether sexual-orientation-related disparities in alcohol use among youth have increased, decreased or remained stable during the past 15 years. Previous findings highlight gender differences [11,14] in alcohol use; in our data source, we found the proportion of sexual minority youth increases over time for girls, but not for boys. Therefore, disaggregating analyses by gender, in order to adhere to the new Sex and Gender Equity in Research (SAGER) international guidelines, [38] is a salient consideration. The SAGER guidelines for researchers and editors are promoted strongly by the Canadian Institutes of Health Research's Institute of Gender and Health; therefore, we have conducted and reported analyses separately by gender.

## METHODS

### Design

Using data from a repeated, cross-sectional survey of middle- and high-school students in British Columbia, Canada, we first estimated the prevalence of life-time alcohol use, age of onset, past 30-day use and past 30-day HED among heterosexual and sexual minority students from 1998 to 2013. Second, we estimated differences between heterosexual and sexual minority youth for these four alcohol-related behaviors for each year of data collection: 1998, 2003, 2008 and 2013. Third, we tested whether the degree to which heterosexual and sexual minority youth differ in life-time alcohol use, age of onset, past 30-day use and past 30-day HED has increased, decreased or remained stable from 1998, 2003 and 2008 to 2013 (our reference category year).

### Data and sample

Data are from the 1998, 2003, 2008 and 2013 British Columbia Adolescent Health Survey (BCAHS), a cross-sectional survey developed to capture the health and risk behavior of youth (ages 12–19) in British Columbia. Conducted by the McCreary Centre Society, the BCAHS is a provincially based cluster-stratified random classroom survey of Canadian public school students in grades 7–12 across

BC. Sample estimates were stratified by grade and health service delivery area in the five health authorities in the province and data collected from participating school districts to be both regionally and provincially representative. Depending on the year, between 78 and 95% of eligible school districts participated in the BCAHS, and the sample sizes for each area were selected to ensure standard errors of  $\leq 3.5\%$  within grade and region strata (original unweighted  $n = 115\,573$ ). Data were weighted to account for non-response and differential probability of sampling and scaled to replicate provincial enrollment (for more information see [39,40]).

To assess trends in alcohol use behaviors, we pooled data from the 1998, 2003, 2008 and 2013 surveys from school districts that participated in at least three of the four surveys. Students who did not provide a valid response to the sexual orientation measure were excluded, bringing the total unweighted sample to  $n = 99\,373$  adolescents throughout 15 years, or 86% of the original samples. Table 1 displays prevalence of sexual orientation by survey year and average age across sexual orientation within survey year.

**Measures**

*Sexual orientation*

A single item was used to measure sexual orientation and asked: ‘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?’. Response options in 1998–2008 were 100% heterosexual (attracted to people of the opposite sex); mostly heterosexual = 2; bisexual (attracted to both males and females); mostly homosexual; 100% homosexual (gay/lesbian; attracted to people of the same sex); and not sure. The 2013 survey response options included: completely heterosexual; mostly heterosexual; bisexual; mostly homosexual; completely homosexual; questioning; and I do not have attractions. After extensive psychometric evaluation of these measures throughout survey collection years (see [41]), we merged those reporting ‘not sure’ (1998–2008), ‘questioning’ (2013) and ‘I don’t have attractions’ (2013) with heterosexual identified youth. Those who reported being ‘mostly homosexual’ were combined with individuals who reported ‘100% homosexual’ or ‘completely homosexual’ identities, depending on the year.

*Sex*

Participants stated whether they were male or female.

**Alcohol Use**

Prior to the section on alcohol use, the survey included an instruction box that defined a drink as ‘1 drink = 1

**Table 1** Samples by sexual orientation and survey year in the British Columbia Adolescent Health Survey.

	1998		2003		2008		2013	
	<i>n</i> (% <sub>wt</sub> )	<i>Mean</i> <sub>age</sub> (95% CI)	<i>n</i> (% <sub>wt</sub> )	<i>Mean</i> <sub>age</sub> (95% CI)	<i>n</i> (% <sub>wt</sub> )	<i>Mean</i> <sub>age</sub> (95% CI)	<i>n</i> (% <sub>wt</sub> )	<i>Mean</i> <sub>age</sub> (95% CI)
<b>Males</b>								
Heterosexual	10 223 (93.8)	14.82 (14.70, 14.95)	13 880 (95.3)	15.04 (14.98, 15.09)	11 573 (94.1)	15.00 (14.96, 15.04)	10 024 (93.2)	14.98 (14.94, 15.02)
Mostly heterosexual	418 (4.2)	15.24 (15.07, 15.41)	432 (3.2)	15.39 (15.25, 15.53)	459 (3.9)	15.55 (15.47, 15.64)	463 (4.4)	15.54 (15.46, 15.62)
Bisexual	127 (1.1)	14.74 (14.55, 14.93)	122 (0.9)	15.52 (15.34, 15.69)	141 (1.2)	15.55 (15.41, 15.70)	153 (1.4)	15.59 (15.49, 15.68)
Gay	84 (0.9)	15.25 (15.00, 15.49)	89 (0.6)	15.86 (15.73, 15.99)	104 (0.9)	15.76 (15.57, 15.95)	118 (1.1)	15.73 (15.61, 15.85)
<b>Females</b>								
Heterosexual	10 829 (90.3)	14.79 (14.68, 14.89)	13 013 (87.4)	14.87 (14.80, 14.93)	11 268 (86.7)	14.98 (14.94, 15.03)	9601 (85.6)	14.89 (14.85, 14.93)
Mostly heterosexual	919 (7.6)	15.59 (15.44, 15.73)	1304 (9.2)	15.58 (15.49, 15.66)	1200 (9.6)	15.55 (15.48, 15.62)	1019 (9.5)	15.62 (15.55, 15.69)
Bisexual	217 (1.9)	15.48 (15.28, 15.68)	428 (3.0)	15.61 (15.49, 15.73)	444 (3.2)	15.44 (15.32, 15.56)	468 (4.0)	15.55 (15.46, 15.64)
Lesbian	41 (0.3)	14.75 (14.63, 14.86)	55 (0.3)	14.93 (14.80, 15.06)	65 (0.5)	15.58 (15.41, 15.76)	92 (0.9)	15.48 (15.37, 15.58)

Percentages are weighted. CI = confidence interval. 1998,  $n = 22\,858$ ; 2003,  $n = 29\,323$ ; 2008,  $n = 25\,254$ ; and 2013,  $n = 21\,938$ . Sample was 48.7% male; mean age was 14.84.

bottle of beer (12 oz.), 1 glass of wine (5 oz.), or 1 shot of hard liquor (1.5 oz.).

#### *Life-time drinking*

Youth reported life-time alcohol use by responding 'no' = 0 or 'yes' = 1 to 'Have you ever had alcohol in your life-time?'

#### *Age of onset*

Participants were asked: 'How old were you when you had your first drink of alcohol other than a few sips?'. Item was recoded to reflect those who had a drink 12 or younger = 1 and those had their first drink after the age of 12 = 0.

#### *Past 30-day drinking*

Youth reported past 30-day drinking by stating how many days they had used alcohol in the previous month. The item was recoded to reflect 0 days/no use = 0 and 1 or more days of alcohol use = 1.

#### *Past 30-day heavy episodic drinking (HED)*

Occurrences of HED were measured with a single item that asked participants to report: 'During the past 30 days, on how many days did you have 5 or more drinks of alcohol within a couple of hours?'. Responses were recoded to reflect no HED = 0 and 1 or more day of HED = 1.

#### *Age*

Age was calculated based on participants' reports of their age in years.

### **Analytical approach**

SPSS Complex Samples version 22 was used to conduct all analyses to apply survey weights and account for the BCAHS complex sampling design. We used crosstabs to examine whether the prevalence of alcohol use behaviors changed across years of analysis (e.g. from 1998, 2003, 2008, 2013) within sexual orientation groups. This preliminary investigation provided valuable information on group-specific changes or stability in trends that inform the interpretation of later comparative analyses. Next, we tested whether sexual minority youth differed from heterosexual youth in the prevalence of each alcohol use behavior within each data collection year, adjusted for age.

Finally, we used logistic regression with year  $\times$  orientation interactions terms to test whether the disparity between heterosexual and sexual minority youth changed (i.e. widened, declined or maintained) since 1998. Comparing absolute measures of inequalities, such as the prevalence of substance use over time, can be misleading because age differences across samples can potentially explain the changes in trends [42]. Within each orientation group, students in 1998 had significantly younger mean

ages than the other years, and within each year lesbian, gay and bisexual youth were somewhat older on average than heterosexual adolescents. Therefore, it is more appropriate to compare age-adjusted odds ratios (ORs). However, ORs cannot be compared directly across different samples [43], and cannot provide the scope of a disparity; to test whether trends changed over time, controlling for age, we computed an interaction term between survey year and sexual orientation in a logistic regression framework. The resulting year  $\times$  sexual orientation interaction term calculates a ratio of ORs which compare the age-adjusted OR of an alcohol use behavior (e.g. 30-day HED) for a particular subgroup (e.g. gay males) versus the referent group (heterosexual males) in a given year (e.g. 2008) to the odds of those with the same identity in 2013 (the reference year) compared to their heterosexual peers. We chose 2013 as the reference year for each of our models to be able to refer consistently to the declining changes in substance use from a historical perspective; as a result, the estimated interaction would need to be interpreted as the inverse of typical ORs (i.e. an interaction OR above 1 would indicate narrowing disparity). For ease of interpretation, we inverted estimated interaction ORs to reflect changes from the past to present. Therefore, an estimated OR for the interaction term above 1 indicates a widening disparity from earlier years to the reference year, and below 1 indicates a declining disparity for that behavior from earlier years for specific sexual orientation identities to the reference year. Essentially, this approach of producing age-adjusted year  $\times$  sexual orientation interaction terms estimates the change in the disparity over time (and, thus, the degree of substance use disparities between groups). More detailed explanations of this approach are available elsewhere [34].

## **RESULTS**

### **Prevalence and trends by sexual orientation**

Rates of alcohol use across all four behaviors generally declined within all sexual orientation groups over time, with some notable exceptions (see Table 2). Unlike heterosexual and bisexual youth, mostly heterosexual and gay male youth did not experience a reduction in life-time alcohol use from 2003 to 2013. Although the prevalence of early onset declined precipitously across survey years for heterosexual youth, sexual minority youth showed less consistent patterns in early onset from 2003 and 2013. Generally, early onset decreased for mostly heterosexual, bisexual and gay males from 1998 to 2013, although comparison within mostly heterosexual, bisexual and gay males showed no difference in early onset between 2003 and 2013. Past 30-day alcohol use among heterosexual males declined across all survey years; however, the same reduction was not evident for mostly heterosexual, bisexual and

**Table 2** Trends in prevalence of life-time use, age of onset, past 30-day use and heavy episodic drinking (HED) across years within sexual orientation groups.

	Prevalence comparison				Trend comparison					
	1998	2003	2008	2013	1998 <sup>a</sup>		2003 <sup>a</sup>		2008 <sup>a</sup>	
	%	%	%	%	aOR <sup>b</sup>	(95% CI)	aOR <sup>b</sup>	(95% CI)	aOR <sup>b</sup>	(95% CI)
Life-time use										
Male										
Heterosexual	65.8	58.6	54.8	45.2	<b>0.34</b>	<b>(0.31, 0.38)</b>	<b>0.44</b>	<b>(0.39, 0.48)</b>	<b>0.56</b>	<b>(0.51, 0.62)</b>
Mostly heterosexual	71.6	60.0	66.5	56.8	<b>0.46</b>	<b>(0.32, 0.67)</b>	0.71	(0.44, 1.13)	<b>0.63</b>	<b>(0.43, 0.92)</b>
Bisexual	60.9	67.5	72.3	57.4	<b>0.16</b>	<b>(0.08, 0.33)</b>	<b>0.30</b>	<b>(0.13, 0.70)</b>	<b>0.29</b>	<b>(0.16, 0.51)</b>
Gay	73.2	65.4	63.7	57.4	<b>0.48</b>	<b>(0.24, 0.94)</b>	1.54	(0.87, 2.72)	0.73	(0.41, 1.32)
Female										
Heterosexual	61.5	55.9	54.1	44.2	<b>0.36</b>	<b>(0.32, 0.40)</b>	<b>0.48</b>	<b>(0.43, 0.54)</b>	<b>0.56</b>	<b>(0.50, 0.62)</b>
Mostly heterosexual	74.2	76.5	72.3	66.6	<b>0.37</b>	<b>(0.28, 0.49)</b>	<b>0.51</b>	<b>(0.40, 0.66)</b>	<b>0.50</b>	<b>(0.39, 0.64)</b>
Bisexual	71.7	82.5	79.4	68.6	<b>0.20</b>	<b>(0.13, 0.31)</b>	<b>0.64</b>	<b>(0.45, 0.91)</b>	<b>0.40</b>	<b>(0.29, 0.57)</b>
Lesbian	67.6	58.2	65.4	64.6	<b>0.43</b>	<b>(0.24, 0.77)</b>	<b>0.27</b>	<b>(0.16, 0.46)</b>	<b>0.31</b>	<b>(0.14, 0.68)</b>
Age of onset										
Male										
Heterosexual	51.1	42.5	36.7	23.8	<b>0.41</b>	<b>(0.38, 0.45)</b>	<b>0.57</b>	<b>(0.51, 0.62)</b>	<b>0.64</b>	<b>(0.60, 0.70)</b>
Mostly heterosexual	45.5	34.6	37.3	28.1	<b>0.39</b>	<b>(0.29, 0.54)</b>	0.80	(0.55, 1.15)	<b>0.64</b>	<b>(0.48, 0.87)</b>
Bisexual	67.6	48.2	48.6	21.3	<b>0.64</b>	<b>(0.39, 1.05)</b>	0.80	(0.48, 1.33)	<b>0.55</b>	<b>(0.34, 0.87)</b>
Gay	59.8	25.8	46.0	36.3	<b>0.58</b>	<b>(0.37, 0.90)</b>	0.92	(0.56, 1.51)	<b>0.62</b>	<b>(0.37, 1.05)</b>
Female										
Heterosexual	40.4	33.1	28.3	17.5	<b>0.41</b>	<b>(0.38, 0.45)</b>	<b>0.56</b>	<b>(0.51, 0.62)</b>	<b>0.65</b>	<b>(0.61, 0.70)</b>
Mostly heterosexual	38.2	32.7	33.9	20.0	0.81	(0.65, 1.02)	<b>0.67</b>	<b>(0.54, 0.83)</b>	<b>0.73</b>	<b>(0.61, 0.89)</b>
Bisexual	63.3	41.6	53.5	31.4	<b>0.65</b>	<b>(0.45, 0.94)</b>	<b>0.52</b>	<b>(0.38, 0.72)</b>	<b>0.56</b>	<b>(0.42, 0.74)</b>
Lesbian	54.5	60.9	55.4	30.1	<b>0.39</b>	<b>(0.20, 0.77)</b>	<b>0.60</b>	<b>(0.36, 0.98)</b>	<b>0.53</b>	<b>(0.36, 0.78)</b>
Past 30-day use										
Male										
Heterosexual	43.9	39.5	36.4	28.0	<b>0.76</b>	<b>(0.67, 0.85)</b>	<b>0.76</b>	<b>(0.67, 0.86)</b>	<b>0.81</b>	<b>(0.73, 0.91)</b>
Mostly heterosexual	52.2	38.2	44.4	34.4	<b>0.56</b>	<b>(0.37, 0.84)</b>	0.95	(0.59, 1.53)	0.69	(0.45, 1.05)
Bisexual	42.7	43.0	52.4	38.2	0.67	(0.40, 1.13)	0.91	(0.44, 1.91)	1.21	(0.64, 2.29)
Gay	54.5	47.4	55.6	44.0	0.83	(0.48, 1.43)	1.35	(0.55, 3.36)	0.79	(0.41, 1.52)
Female										
Heterosexual	41.0	37.9	36.0	28.3	<b>0.36</b>	<b>(0.32, 0.40)</b>	<b>0.48</b>	<b>(0.43, 0.54)</b>	<b>0.56</b>	<b>(0.50, 0.62)</b>
Mostly heterosexual	51.6	55.9	53.5	47.1	<b>0.37</b>	<b>(0.28, 0.49)</b>	<b>0.51</b>	<b>(0.40, 0.66)</b>	<b>0.50</b>	<b>(0.39, 0.64)</b>
Bisexual	54.9	60.7	58.5	44.5	0.84	(0.55, 1.28)	<b>0.46</b>	<b>(0.31, 0.69)</b>	<b>0.54</b>	<b>(0.39, 0.74)</b>
Lesbian	51.9	43.5	50.0	34.3	0.62	(0.29, 1.34)	1.09	(0.58, 2.02)	1.00	(0.59, 1.69)
Past 30-day HED										
Male										
Heterosexual	29.2	27.1	24.6	18.0	<b>0.45</b>	<b>(0.41, 0.50)</b>	<b>0.57</b>	<b>(0.51, 0.64)</b>	<b>0.64</b>	<b>(0.59, 0.70)</b>
Mostly heterosexual	34.5	20.8	28.2	18.2	<b>0.37</b>	<b>(0.26, 0.52)</b>	0.83	(0.54, 1.26)	<b>0.57</b>	<b>(0.41, 0.79)</b>
Bisexual	32.1	32.0	36.7	27.7	0.63	(0.37, 1.05)	0.79	(0.50, 1.25)	0.65	(0.40, 1.06)
Gay	38.4	28.2	38.7	29.2	<b>0.61</b>	<b>(0.38, 0.97)</b>	1.11	(0.55, 2.25)	0.66	(0.38, 1.16)
Female										
Heterosexual	25.1	23.7	22.6	17.2	<b>0.57</b>	<b>(0.51, 0.63)</b>	<b>0.64</b>	<b>(0.57, 0.70)</b>	<b>0.72</b>	<b>(0.66, 0.78)</b>
Mostly heterosexual	34.4	36.4	34.3	29.2	<b>0.78</b>	<b>(0.61, 0.98)</b>	<b>0.70</b>	<b>(0.56, 0.88)</b>	<b>0.76</b>	<b>(0.63, 0.93)</b>
Bisexual	37.0	42.9	39.2	29.2	<b>0.70</b>	<b>(0.49, 0.98)</b>	<b>0.55</b>	<b>(0.39, 0.76)</b>	<b>0.63</b>	<b>(0.48, 0.83)</b>
Lesbian	35.5	25.6	40.9	20.7	<b>0.36</b>	<b>(0.19, 0.70)</b>	<b>0.65</b>	<b>(0.43, 0.98)</b>	<b>0.38</b>	<b>(0.25, 0.57)</b>

Data were weighted. Odds ratios (OR) shown in bold type indicate  $P < 0.05$ . <sup>a</sup>Reference year is 2013. <sup>b</sup>Odds ratios adjusted for age. aOR = adjusted odds ratio; CI = confidence interval.

gay males. Unlike heterosexual, mostly heterosexual and bisexual females, lesbians did not display a decrease in past 30-day alcohol use throughout the 15 years of data collection. Heterosexual males were the only group with

decreasing HED for all year comparisons. HED decreased among mostly heterosexual and gay males from 1998 to 2013, but bisexual males had stable rates of HED across all years. There were significant decreases for all female

sexual orientation groups in the prevalence of HED when comparing 2013 to previous years.

### Disparities in alcohol use between sexual minority and heterosexual youth across years

Age-adjusted ORs documenting disparities between sexual minority and heterosexual male youth by year are presented in Table 3. Mostly heterosexual and bisexual, but not gay male, youth reported higher odds of life-time alcohol use in 2008 only. Compared to heterosexuals, bisexual males were more likely to start drinking prior to the age of 13 in 1998 and 2008 and gay males in 2008 and 2013. Mostly heterosexual males were more likely than heterosexual males to report drinking before the age of 12 in 2013. Bisexual and gay males had greater odds of past 30-day alcohol use than heterosexual peers in 2008 and mostly heterosexual males reported lower risk for past 30-day heavy episode drinking compared to heterosexual males in 2003 and 2013.

Female disparities in alcohol use behaviors, also adjusted for age, are presented in Table 4. Mostly heterosexual females had greater odds of life-time alcohol use, early age of onset and past 30-day alcohol use across all survey years except for past 30-day alcohol use in 1998. Compared to heterosexual females, bisexual females had greater odds of life-time alcohol use and past 30-day alcohol use in 2003, 2008 and 2013 and earlier age of onset for all survey years. Lesbian youth had higher odds of having their first drink prior to the age of 13 than heterosexual females in 2003, 2008 and 2013 and higher odds of reporting life-time

alcohol use in 2013. Mostly heterosexual and bisexual females had greater odds of HED in 2003, 2008 and 2013, compared to heterosexual youth. Only lesbians had greater odds than heterosexual female youth for HED in 2008.

### Trends in alcohol use disparities over time

Lastly, we tested whether the difference in alcohol use behaviors by sexual orientation have decreased, widened or remained stable from 1998 to 2013 by modeling interactions terms of sexual orientation by survey year while adjusting for age (see Table 5). For males, the significant interaction between gay males and the year 2003 indicates that the gap between the age of onset between heterosexual and gay males has widened from 2003 to 2013. All other differences between heterosexual and sexual minority youth were stable across years.

There were a number of changes in risk across outcomes for females. Disparities between heterosexual and mostly heterosexual females from 1998 to 2013 widened for life-time alcohol use, past 30-day alcohol use and HED. Bisexual females' risk for life-time alcohol use increased from 1998 to 2013, but decreased for age of onset during that same time.

## DISCUSSION

This study is the first, to our knowledge, to examine trends in alcohol use disparities between heterosexual and sexual minority adolescents. Using a provincially representative sample of British Columbia adolescents between 1998

**Table 3** Male sexual orientation disparities in life-time alcohol use, age of onset, past 30-day alcohol use and past 30-day heavy episodic drinking (HED) within year.

	1998		2003		2008		2013	
	aOR <sup>a</sup>	(95% CI)						
Life-time alcohol use <sup>b</sup>								
Mostly heterosexual	1.09	(0.83, 1.44)	0.89	(0.64, 1.25)	<b>1.33</b>	<b>(1.06, 1.68)</b>	1.24	(0.99, 1.55)
Bisexual	0.82	(0.48, 1.39)	1.21	(0.74, 1.97)	<b>1.79</b>	<b>(1.10, 2.92)</b>	1.26	(0.85, 1.87)
Gay	1.22	(0.65, 2.26)	0.90	(0.50, 1.61)	1.06	(0.63, 1.78)	1.19	(0.78, 1.80)
Age of onset <sup>b</sup>								
Mostly heterosexual	1.01	(0.75, 1.36)	0.83	(0.54, 1.27)	1.21	(0.91, 1.61)	<b>1.35</b>	<b>(1.01, 1.81)</b>
Bisexual	<b>1.93</b>	<b>(1.08, 3.44)</b>	1.40	(0.71, 2.77)	<b>1.86</b>	<b>(1.16, 3.00)</b>	0.95	(0.54, 1.67)
Gay	1.76	(0.96, 3.26)	0.66	(0.36, 1.18)	<b>1.85</b>	<b>(1.05, 3.25)</b>	<b>2.38</b>	<b>(1.39, 4.05)</b>
Past 30-day alcohol use <sup>b</sup>								
Mostly heterosexual	1.20	(0.94, 1.52)	0.79	(0.57, 1.09)	1.09	(0.87, 1.37)	1.07	(0.85, 1.34)
Bisexual	0.98	(0.59, 1.65)	0.96	(0.59, 1.55)	<b>1.60</b>	<b>(1.05, 2.44)</b>	1.28	(0.87, 1.86)
Gay	1.36	(0.73, 2.55)	0.94	(0.48, 1.83)	<b>1.68</b>	<b>(1.00, 2.85)</b>	1.56	(1.03, 2.35)
Past 30-day HED <sup>b</sup>								
Mostly heterosexual	1.06	(0.80, 1.41)	<b>0.56</b>	<b>(0.37, 0.86)</b>	0.92	(0.72, 1.18)	<b>0.79</b>	<b>(0.61, 1.02)</b>
Bisexual	1.23	(0.68, 2.22)	1.07	(0.64, 1.78)	1.45	(0.91, 2.31)	<b>1.41</b>	<b>(0.95, 2.08)</b>
Gay	1.33	(0.69, 2.58)	0.66	(0.32, 1.36)	1.39	(0.80, 2.41)	<b>1.42</b>	<b>(0.88, 2.30)</b>

Data were weighted. Odds ratios (OR) shown in bold type indicate  $P < 0.05$ . <sup>a</sup>Adjusted for age; <sup>b</sup>heterosexual is reference group. CI = confidence interval; aOR = adjusted odds ratio.

**Table 4** Female sexual orientation disparities in life-time alcohol use, age of onset, past 30-day alcohol use and past 30-day heavy episodic drinking (HED) within year.

	1998		2003		2008		2013	
	aOR <sup>a</sup>	(95% CI)	aOR <sup>a</sup>	(95% CI)	aOR <sup>a</sup>	(95% CI)	aOR <sup>a</sup>	(95% CI)
Life-time alcohol use <sup>b</sup>								
Mostly heterosexual	<b>1.34</b>	<b>(1.09, 1.65)</b>	<b>2.05</b>	<b>(1.68, 2.50)</b>	<b>1.85</b>	<b>(1.57, 2.19)</b>	<b>1.96</b>	<b>(1.64, 2.34)</b>
Bisexual	1.23	(0.77, 1.96)	<b>2.99</b>	<b>(1.94, 4.60)</b>	<b>3.07</b>	<b>(2.33, 4.07)</b>	<b>2.35</b>	<b>(1.80, 3.07)</b>
Lesbian	1.48	(0.69, 3.14)	1.07	(0.52, 2.22)	1.25	(0.64, 2.47)	<b>1.90</b>	<b>(1.09, 3.33)</b>
Age of onset <sup>b</sup>								
Mostly heterosexual	<b>1.38</b>	<b>(1.07, 1.78)</b>	<b>1.27</b>	<b>(1.07, 1.52)</b>	<b>1.54</b>	<b>(1.27, 1.86)</b>	<b>1.35</b>	<b>(1.10, 1.66)</b>
Bisexual	<b>4.46</b>	<b>(2.75, 7.22)</b>	<b>1.79</b>	<b>(1.35, 2.37)</b>	<b>3.38</b>	<b>(2.55, 4.48)</b>	<b>2.37</b>	<b>(1.80, 3.11)</b>
Lesbian	1.75	(0.68, 4.50)	<b>4.11</b>	<b>(1.33, 12.68)</b>	<b>4.53</b>	<b>(1.74, 11.80)</b>	<b>2.19</b>	<b>(1.13, 4.25)</b>
Past 30-day alcohol use <sup>b</sup>								
Mostly heterosexual	1.18	(0.99, 1.42)	<b>1.70</b>	<b>(1.43, 2.02)</b>	<b>1.75</b>	<b>(1.52, 2.03)</b>	<b>1.78</b>	<b>(1.52, 2.09)</b>
Bisexual	1.43	(0.95, 2.15)	<b>2.08</b>	<b>(1.48, 2.93)</b>	<b>2.32</b>	<b>(1.80, 3.00)</b>	<b>1.63</b>	<b>(1.30, 2.06)</b>
Gay	1.76	(0.82, 3.75)	1.26	(0.61, 2.61)	1.44	(0.76, 2.71)	1.04	(0.60, 1.80)
Past 30-day HED <sup>b</sup>								
Mostly heterosexual	1.19	(0.99, 1.44)	<b>1.49</b>	<b>(1.23, 1.80)</b>	<b>1.52</b>	<b>(1.31, 1.78)</b>	<b>1.56</b>	<b>(1.32, 1.83)</b>
Bisexual	1.40	(0.92, 2.14)	<b>1.99</b>	<b>(1.37, 2.87)</b>	<b>2.00</b>	<b>(1.58, 2.53)</b>	<b>1.58</b>	<b>(1.24, 2.01)</b>
Lesbian	1.88	(0.88, 4.02)	1.09	(0.56, 2.12)	<b>1.98</b>	<b>(1.06, 3.71)</b>	1.01	(0.58, 1.77)

Data were weighted. Odds ratios (OR) shown in bold type indicate  $P < 0.05$ . <sup>a</sup>Adjusted for age; <sup>b</sup>heterosexual is reference group; aOR = adjusted odds ratio; CI = confidence interval.

**Table 5** Trends in disparities in life-time alcohol use, age of onset, past 30-day alcohol use and past 30-day heavy episodic drinking (HED): interactions between sexual orientation and year<sup>a</sup>.

	Life-time alcohol use		Age of onset		30-day alcohol use		30-day HED	
	aOR <sup>b</sup>	(95% CI)	aOR <sup>b</sup>	(95% CI)	aOR <sup>b</sup>	(95% CI)	aOR <sup>b</sup>	(95% CI)
Males								
Mostly heterosexual by year 1998	1.19	(0.83, 1.69)	1.36	(0.90, 2.06)	0.69	(0.42, 1.13)	0.77	(0.53, 1.12)
Mostly heterosexual by year 2003	1.45	(0.97, 2.18)	1.62	(0.96, 2.72)	1.26	(0.70, 2.29)	1.45	(0.88, 2.37)
Mostly heterosexual by year 2008	0.96	(0.70, 1.31)	1.12	(0.75, 1.68)	0.85	(0.53, 1.38)	0.88	(0.61, 1.25)
Bisexual by year 1998	1.60	(0.83, 3.09)	0.49	(0.22, 1.10)	0.77	(0.31, 1.90)	1.16	(0.57, 2.37)
Bisexual by year 2003	1.09	(0.59, 2.02)	0.67	(0.28, 1.64)	1.19	(0.39, 3.67)	1.35	(0.71, 2.55)
Bisexual by year 2008	0.73	(0.39, 1.34)	0.51	(0.25, 1.07)	1.47	(0.63, 3.44)	0.98	(0.54, 1.78)
Gay by year 1998	1.03	(0.48, 2.18)	1.36	(0.61, 3.05)	0.78	(0.26, 2.34)	1.09	(0.48, 2.49)
Gay by year 2003	1.41	(0.70, 2.86)	<b>3.56</b>	<b>(1.60, 7.90)</b>	1.80	(0.58, 5.57)	2.23	(0.95, 5.25)
Gay by year 2008	1.17	(0.61, 2.25)	1.30	(0.60, 2.81)	0.79	(0.30, 2.07)	1.04	(0.51, 2.12)
Females								
Mostly heterosexual by year 1998	<b>1.52</b>	<b>(1.16, 1.99)</b>	0.99	(0.72, 1.38)	<b>1.58</b>	<b>(1.25, 2.01)</b>	<b>1.34</b>	<b>(1.05, 1.72)</b>
Mostly heterosexual by year 2003	0.98	(0.76, 1.27)	1.05	(0.80, 1.38)	1.09	(0.86, 1.37)	1.08	(0.85, 1.39)
Mostly heterosexual by year 2008	1.08	(0.85, 1.37)	0.89	(0.68, 1.18)	1.04	(0.84, 1.28)	1.05	(0.84, 1.30)
Bisexual by year 1998	<b>1.95</b>	<b>(1.14, 3.33)</b>	<b>0.54</b>	<b>(0.31, 0.94)</b>	1.20	(0.75, 1.92)	1.16	(0.71, 1.88)
Bisexual by year 2003	0.79	(0.48, 1.30)	1.31	(0.88, 1.95)	0.81	(0.54, 1.22)	0.82	(0.53, 1.27)
Bisexual by year 2008	0.77	(0.53, 1.11)	0.72	(0.48, 1.06)	0.72	(0.52, 1.01)	0.81	(0.58, 1.13)
Lesbian by year 1998	1.29	(0.51, 3.26)	1.26	(0.40, 3.96)	0.60	(0.24, 1.54)	0.55	(0.21, 1.41)
Lesbian by year 2003	1.80	(0.73, 4.45)	0.52	(0.14, 1.95)	0.86	(0.35, 2.11)	0.95	(0.40, 2.27)
Lesbian by year 2008	1.54	(0.65, 3.63)	0.50	(0.16, 1.57)	0.74	(0.33, 1.67)	0.52	(0.23, 1.20)

Data were weighted. Odds ratios (OR) in bold type indicate  $P < 0.05$ . <sup>a</sup>Heterosexual by year 2013 is reference group; <sup>b</sup>adjusted model included sexual orientation, survey year and age along with orientation  $\times$  year interactions; aOR = adjusted odds ratio; CI = confidence interval.

and 2013, we found that, despite growing acceptance in societal attitudes towards LGB populations in North America, disparities in alcohol use among sexual minority

youth have generally maintained their degree of difference, and in some cases, widened, compared with their non-sexual minority counterparts.

Findings regarding within-sexual-orientation prevalence of life-time alcohol use, age of onset, past 30-day alcohol use and past 30-day heavy episodic drinking (HED) are positive, and consistent with other North American data: adolescent alcohol use is declining [1,2]. Also similar to previous studies and meta-analyses [11,12,35], sexual minority females demonstrated a greater number of disparities in alcohol use behavior throughout the 15-year time span than were observed in the comparisons between heterosexual and sexual minority males. Furthermore, as with previous research, bisexual and mostly heterosexual youth in our study displayed greater risk for alcohol use behaviors across years when compared to their heterosexual peers, especially among girls while gay/lesbian youth did not differ from heterosexual youth in 23 of the 32 comparisons.

Despite the general decline in the prevalence of alcohol use behaviors since 1998, our novel assessment of the stability of alcohol use behaviors throughout sexual identity groups suggests that the difference between these groups has remained fairly consistent, with a few exceptions. Since 1998 the disparity in life-time alcohol use, past 30-day use and past 30-day HED between heterosexual and mostly heterosexual girls widened, as did disparities in life-time alcohol use between heterosexual and bisexual girls; although disparities in early onset between heterosexual and bisexual females narrowed from 1998 to 2013. Among gay boys our results showed a growing disparity in early age of onset compared to heterosexual peers from 2003 to 2013.

Findings from our study support a need for further research to explain an unanswered question: if attitudes towards LGB people are improving, then why do disparities in alcohol use among sexual minority youth remain? Although we cannot make direct inferences from these trend data, one possible explanation might reside in the clash between increasing societal acceptance and developmental trends in peer social regulation [44]: youth are disclosing their LGB identities at younger ages [44,45], due in part to greater acceptance of LGB identities in the broader society, yet early adolescence is a time during which peers begin to socially regulate gender and sexuality [46,47] and are more likely to report prejudicial attitudes and homophobic behavior [48,49]. Therefore, although overall attitudes are improving in society, youth may remain susceptible to developmentally situated and prejudiced experiences in their peer groups that lead to substance use. Interestingly, this trend might be reflected in our findings on the prevalence of heterosexuality among adolescent females which declined from 1998 (90.3%) to 2013 (85.6%). If secular trends in attitudes towards sexual minorities are contributing to more youth reporting lesbian, bisexual and unsure identities, sexual orientation comparisons in modern cohorts might provide more accurate samples of sexual minority females compared to earlier years.

The increase in alcohol use among mostly heterosexual and bisexual girls is also counter to expectations, given the changing social climate. Why does this group appear to be particularly at risk? Studies demonstrate the increasingly disproportionate risk of bisexual and mostly heterosexual youth and adults within a host of outcomes relative to heterosexual and lesbian/gay peers [16,35–37], often linked to prejudice coming from both heterosexual and gay/lesbian communities [50–52]. Although broader attitudes do not appear to mitigate risk for alcohol use among sexual minority youth, these changing attitudes may favor lesbian/gay identities differentially as opposed to those who identify as mostly heterosexual and bisexual.

Given persistent disparities in alcohol use among sexual minority adolescent over time, despite the shifting culture milieu, there is a clear need for focused programs and policies for sexual minority youth. Given that studies demonstrate the role of minority stress in sexual minority youth alcohol use [31], programs and policies that specifically address anti-LGB discrimination and homophobic bullying in schools help to reduce sexual minority youth experiences of prejudice [53] in ways that may, subsequently, reduce their alcohol use. Similarly, programs using prevention curricula should consider curricula that address specifically relevant experiences of prejudice and discrimination: for example, one of the only published interventions of a randomized clinical trial with young adult gay men showed that incorporating conversations about minority stress into therapy protocols helped reduce substance use and improved mental health [54].

Like all studies, there are limitations. Notably, we position our perspective of trends in alcohol use within the shifting social context, yet youth may have a different experience and understanding of changes. We were unable to capture that perspective with these data. We also use a single item measure of sexual orientation; however, reports of sexual identity, attraction and behavior do not align consistently within people, and studies that investigate alcohol use outcomes simultaneously across different indicators of sexual orientation demonstrate differential risk [36]. Therefore, estimates of risk may vary depending on sexual orientation measurement. These data are also geographically limited and reflect a single Canadian province; considering the large variability in local, regional and country socio-cultural and legal environments related to LGB people, findings may not reflect the experience of youth in other countries. Future studies should consider implementing this approach to other repeating population-based data sources to help broaden our understanding of changes in sexual minority youth experiences. Data were also collected using Statistics Canada's conventional measure for ethnicity, precluding the use of an ethnicity variable that provides mutually exclusive categories. Therefore, we do not include ethnicity in our adjustment

of analytical models. Finally, the BCAHS data were collected in schools, and therefore do not represent the experience of youth who were not enrolled. Given the disproportionately high number of sexual minority youth who experience homelessness [55] and school pushout [56] and the link between these experiences and substance use [57], such limitations need to be acknowledged.

Despite these limitations, there are several strengths of the current study. First, the use of a large population-based survey of adolescents in schools provided us with an opportunity to disaggregate trends based on those with mostly heterosexual, bisexual and gay/lesbian sexual orientations. Secondly, because ORs are not directly comparable across groups [58], but a widely used statistic, our novel statistical approach offers new opportunities for substance use researchers to examine how differences in risk may be changing over time. Notably, the applications of this approach with these data is a testament to the importance of sexual (and gender) minority identity markers in large, school-based samples—without these data, we are unable to document if youth experiences change over time and the (potential) effects of social movements and policy [59,60].

Our findings provide valuable information regarding the stability and widening of disparities in alcohol use among sexual minority youth from 1998 to 2013, even in the face of growing social acceptance of LGB people in North America. This juxtaposition may be explained partially by developmental vulnerabilities in peer interaction and cognitive processes that warrant the implementation of enumerated policies and focused intervention programs for this population. Future studies are needed to explore more effectively how contexts influence youth wellbeing and in what ways these changing attitudes, policies and programs might alleviate alcohol use disparities among sexual minority youth.

#### Declaration of interests

None.

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