ATLANTIC CANADIAN HIGH SCHOOL STUDENTS AND ALCOHOL-RELATED HARMS: ARE THERE DIFFERENCES ACROSS SEX, SEXUAL ORIENTATION AND PSYCHOSOCIAL INDICATORS?

by

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Abstract

Alcohol is responsible for the greatest burden of acute harms in youth aged 15-24, with one fifth reporting at least one form of harm (physical, social, legal) in the past 12 months. This study sought to determine which factors impact Atlantic Canadian high school students' experiences with alcohol-related harms, placing an emphasis on sexual orientation, using data from the 2012 Atlantic Student Drug Use Survey. Using unadjusted logistic regression, we determined that mostly heterosexual females were 1.39 (95% CI 1.04-1.86), and bisexual females were 1.52 (95% CI 1.001-2.32) times more likely to experience any harm than heterosexual females. These associations disappeared after adjustment for a set of covariates. Other factors that significantly increased the odds of experiencing any alcohol-related harms in both males and females included cannabis use, low parental connectedness and high sensation seeking tendencies. Our study findings have the potential to inform future harm reduction policies and strategies.

List of Abbreviations Used

ASDUS	Atlantic Student Drug Use Survey
BSSS-4	Brief Sensation Seeking Scale
CES-D-12	Center for Epidemiological Studies-Depression Scale
CI	Confidence interval
DUI	Driving under the influence
DUHSREB	Dalhousie University Health Sciences Research Ethics Board
HRSB	Halifax Regional School Board
IQR	Inter-quartile range
IRR	Incidence rate ratio
LGB	Lesbian, Gay or Bisexual
LGBT	Lesbian, Gay, Bisexual or Transgender
NB	New Brunswick
NFLD	Newfoundland and Labrador
NS	Nova Scotia
OR	Odds ratio
MVC	Motor vehicle crash
SDUSAP	Student Drug Use Survey in the Atlantic Provinces
SES	Socioeconomic status
YSS	Youth Smoking Survey

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Chapter 1: Introduction

1.1 Adolescent Alcohol Consumption in Canada

Adolescence and young adulthood is a period characterized by change and extensive identity exploration (1). This developmental period involves physical, emotional and lifestyle changes that can put young people at risk, including risk related to substance use (2). The vast majority of substance use is initiated during adolescence (3). Adolescents have a tendency to frequently seek new experiences, while focusing more on the positive rewards of their actions rather than the potential negative consequences (4). Psychologically, this phenomenon is explained by competition between two brain systems during this stage of development. The first, a subcortical socio-emotional system, involves areas such as the nucleus accumbens, amygdala and medial prefrontal cortex. This system goes through a process of remodelling post-puberty which enhances its efficiency and sensitivity, causing an overactive release of dopamine. Increased dopamine release subsequently leads to hyper-responsiveness to incentives. The second, a cognitive control complex, involves areas such as the lateral prefrontal cortex and parts of the anterior cingulate cortex. Conversely, this system which controls impulsive behaviour (among other processes) undergoes a slower process of maturation that continues into young adulthood (4).

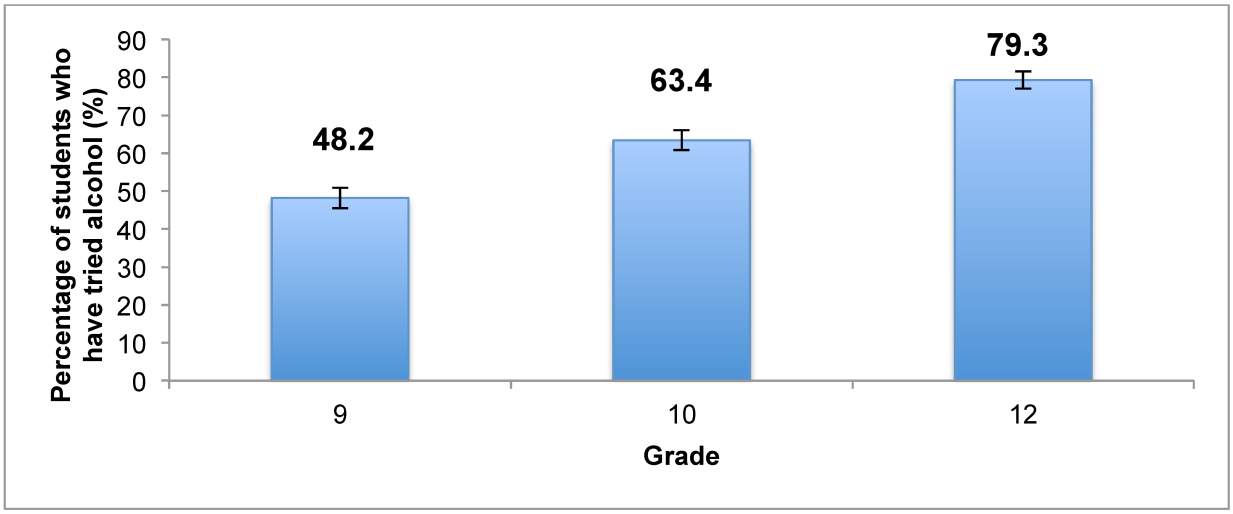
Peer pressure and conformity to norms also largely influence initiation of substance use during adolescence (4,5). Parental monitoring begins to decrease during late adolescence, and peer groups emerge as the individual's primary social influence. This step of development is important as it encourages adolescents to explore their interests and gain a

sense of belonging; however, the individual is required to conform (to an extent) to the values and behaviours of peers. Although these values may not be consistent with their own personal beliefs, adolescents may feel peer pressure to conform to these social norms (5).

For most adolescents, substance use is occasional or experimental; however, a substantial portion will harm their current or subsequent health, and through their substance use they may also threaten the well-being of others (6). Patterns of adult substance use are often established during adolescence, underscoring the need to carry out substance use research during this period (7).

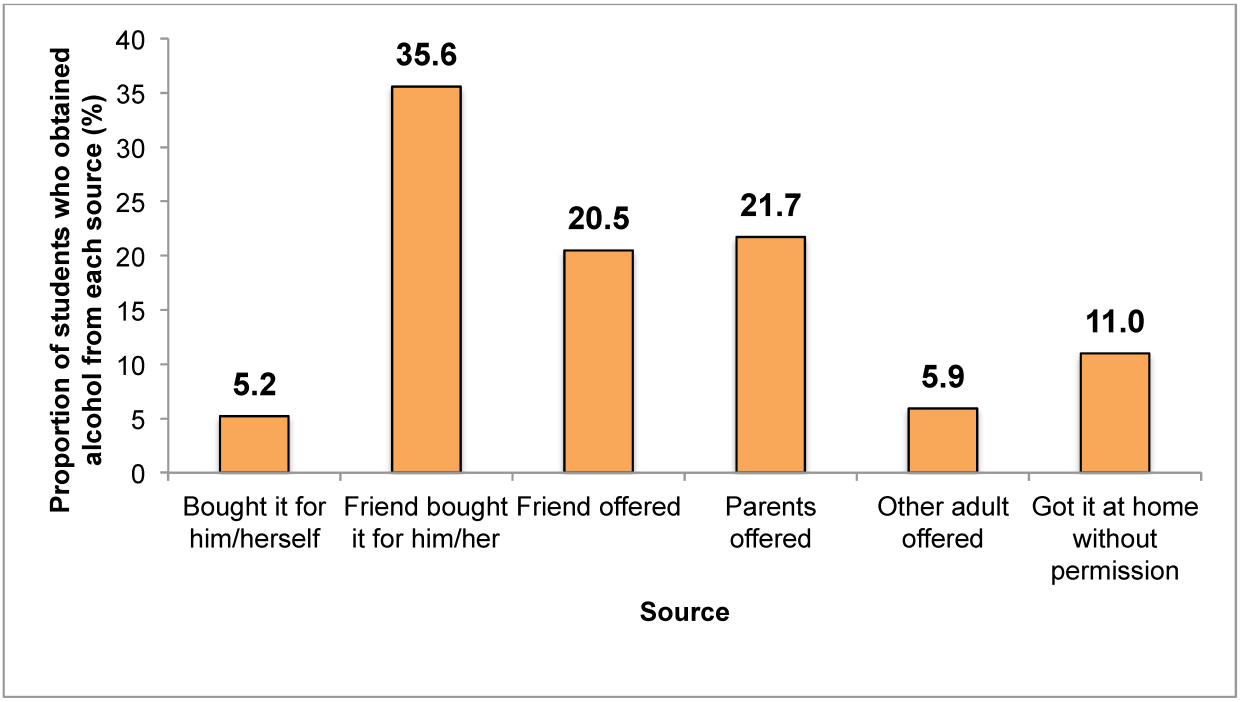
Alcohol is by far the most common substance used and abused by youth in Canada (6). The 2012-2013 Youth Smoking Survey found that 60% of Canadian students in grades 10-12 had tried alcohol and that 46% had engaged in binge drinking (i.e., consumed ≥5 drinks in one sitting) at least once in the past 12 months (8). In Atlantic Canada, the 2007 iteration of the Student Drug Use Survey in the Atlantic Provinces (SDUSAP) examined the 12-month prevalence of any alcohol use among grades 9, 10 and 12 students (Figure 1).

Figure 1. Proportion of grade 9, 10 and 12 students in Atlantic Canada who have tried alcohol in the past 12 months according to the 2007 SDUSAP (with 99% confidence interval) (9).



The proportion of students engaging in any alcohol use increased by grade: from 48.2% in grade 9 to 79.3% in grade 12. The mean age of alcohol initiation in Nova Scotia was 12.9 years, which is significantly lower than the national average of 15.6 years (9,10). The 2007 SDUSAP also examined how junior and senior high school students under the legal drinking age of 19 in the Atlantic Provinces obtained their alcohol (Figure 2).

Figure 2. Methods of acquiring alcohol, and proportion of 2007 SDUSAP respondents under the age of 19 who used each method the last time they drank (9).



The most common method of acquiring alcohol for adolescents in Atlantic Canada is having a friend purchase it (35.6%), followed by parents offering (21.7%) and friends offering (20.5%). Surprisingly, 12.3% of students in grade 10, and 35% of students in grade 12 reported drinking in a licensed venue over the past 12 months (9).

Some suggest that since those under the age of 19 in Atlantic Canada cannot legally buy alcohol, the only alcohol-consumption guideline for this age group should be "Don't drink." However, Figures 1 and 2 depict the reality: a significant proportion of Atlantic Canadian adolescents in Atlantic Canada consume alcohol, obtained from a variety of different sources. Furthermore, the 2004 Canadian Addiction Survey, a survey of youth aged 15-24, found that that more than a third of young drinkers drank at a hazardous level

(11). Given the high rates of alcohol use and misuse in adolescence, it is important to study the consequences of these actions (1). These consequences are henceforth referred to as "alcohol-related harms".

1.2 Alcohol-Related Harms

The term alcohol-related harms refers to a broad range of events (both immediate and long-term) that occur as direct consequences of alcohol consumption (1). In Canada, 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 hospitals for those aged 15 or more (12). Though tobacco use accounts for the largest proportion of each aforementioned outcome 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 (12,13). The 2004 Canadian Addiction Survey found that among drinkers aged 15-24 years, one fifth reported experiencing at least one form of harm due to their drinking during the past year alone (11). In addition to the health and social costs, alcohol also poses a significant economic burden. In Canada, the estimated total direct and indirect costs of alcohol were $14.6 billion, based on 2002 data. This figure includes $7.1 billion due to indirect productivity losses, $3.3 billon in direct costs to health care and $3.1 billion in direct costs to law enforcement (10).

The nature of alcohol-related harms can be outlined using two categories: intoxication and regular and prolonged use (6). The slow absorption of alcohol into the bloodstream and central nervous system contributes to intoxication-related harms due to the difficulty in measuring doses. This mainly leads to incidents of alcohol overdose, poisoning and

binge drinking as the drinker may not immediately recognize they have consumed alcohol at a harmful level, and may continue to drink (14). Younger and newer drinkers may also be more sensitive to the effects of alcohol intoxication when compared to adults, as they have not yet explored their limits or developed a level of tolerance. Toxicity has also been shown to occur at lower doses in younger populations (15).

Intoxication is associated with acute harms, and is the most impactful category of harms to adolescents (6). Alcohol intoxication can lead to risk taking behaviour, particularly in adolescents where the consequences of heavy drinking may be viewed as a "rite of passage" (16,17). In addition to affecting the ability to evaluate risk, alcohol impairs judgement and reasoning (18). The immediate consequences of drinking include, but are not limited to, sexual risk taking, poor academic performance, violence, aggression, conflict, accidents and injuries. (1,14).

Regular and prolonged use of substances is associated with long-term health consequences such as cancers, liver disease, hypertension and dependency. In adolescents, chronic heavy exposure can interfere with brain development and cause memory loss, as well as other cognitive impairments. Adolescents are at a greater risk for lasting brain damage from heavy alcohol consumption than are adults (19). Adolescents who are regular heavy drinkers can begin to experience symptoms of long-term poor health as early as their mid-20s, and are at a higher risk of continuing alcohol dependence (6).

Given the significant physical, social and economic costs of adolescent alcohol use, its related consequences are a priority to study (12). The 2007 SDUSAP examined the past 12-month prevalence of several acute alcohol-related harms in the four Atlantic Canadian provinces (Table 1). The prevalence of each outcome increases with increasing grade of study, and each outcome is reported as a proportion of those surveyed (i.e. drinkers and non-drinkers).

Table 1. Prevalence of select alcohol-related harms in Atlantic Canadian high school students over the past 12-months, according to the 2007 iteration of the SDUSAP (9).

Alcohol-related harm	**Prevalence by grade (%)**		
	Grade 9	Grade 10	Grade 12
School work or exams affected by drinking	2.0	2.6	3.7
Trouble with police	2.7	3.9	4.9
Spending on alcohol preventing other purchases	5.5	8.6	9.7
Consuming alcohol before breakfast	4.3	4.9	8.2
Tensions or disagreements with family or friends	7.5	11.3	11.5
Damaging property	9.6	13.7	15.3
Injury to oneself	9.6	13.7	15.7
Driving under the influence[+]	--	13.5	18.1
Unplanned sex[++]	27.0	31.4	39.7

[+]Among licensed drivers.
[++]Among sexually active adolescents.

Of the harms listed in Table 1, having schoolwork or exams affected by alcohol consumption was the least prevalent in each grade. Unplanned sex under the influence of alcohol or drugs was the most prevalent of the above harms; however, it must be noted

that this harm is reported among sexually active adolescents, and not all adolescents included in the survey (9).

Given that alcohol consumption is necessary to *propagate* alcohol-related harms, it is assumed that the predictors of these two behaviours overlap significantly. However, consuming alcohol and consuming alcohol at levels causing harm are differing concepts (1). Bellis *et al*. (20) reported that increased drinking and binge drinking frequency increase the odds of alcohol-related harms in adolescents. It must be noted, however, that even those who drink at relatively low frequencies and do not binge still may experience adverse effects. For example, 10.6% of a sample of 15-16 year olds in England who drank less than once a month still propagated drunken violence. What characteristics of adolescents, other than intoxication levels, may put them at risk for specific (or multiple) alcohol-related harms?

1.3 Harm Reduction in Alcohol Prevention

The demonstrated impact of alcohol and its related harms on the social and economic well being of Canadians indicates a need to take a closer look at what subpopulations are most affected. 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 (21).

The present study adopts a harm-reduction approach, attempting to identify what characteristics of adolescents put them most at risk for alcohol-related harms, or act as

protective factors. This contrasts with more traditional approaches such as universal prevention, where all drinkers are treated as equally at risk. Historically, universal prevention programs in school settings, often grounded in abstinence-only principles, have not been successful (22). Harm-reduction approaches with youth may be considered controversial, as federal and provincial laws prohibit the sale of alcohol to minors. However, harm-reduction strategies have consistently shown considerable promise in universal prevention when compared to an "abstinence" approach, and are generally considered best practice (21,22).

Though prevalence studies exist in the literature to describe patterns of alcohol-related harms in young populations (23), few examine high school students, and only one of these examines a potentially important factor within this group: sexual orientation (24). Additionally, no current study explores the relationship between these two variables when taking into account a range of covariates, such as psychosocial indicators that have established associations with both sexual orientation and alcohol use.

1.4 Sex, Sexual Orientation and Alcohol-Related Harms

Patterns of adolescent alcohol use vary significantly by sex (25). In the general population, men typically report heavier use of alcohol than women (26). Certain alcohol-related harms are disproportionately associated with being male, such as drunken violence. Other harms are more often associated with being female, such as sexual regret (26). Benton *et al*. (27) examined twelve alcohol-related consequences in undergraduate students, grouping them into two categories: More Common Consequences (performing poorly on a test, damaging property, receiving a lower grade, being unconscious or

passing out) and Less Common Consequences (being in a vehicular accident, requiring medical attention, dropping a class, failing a class, being in trouble with the authorities). They found that only 20% of the variance in alcohol-related negative outcomes is explained by gender and alcohol consumption. Though men typically report heavier alcohol use than women, women generally achieve higher blood alcohol concentration than men at equal consumption levels. Sugarman *et al.* (28) posit that this phenomenon may cause females to experience more alcohol-related harms than males in an undergraduate population. They found that being female increased the risk of several harms, including blacking out and getting injured, and being male increased risk for damaging property and violence (28). An additional demographic variable that may account for some of the unexplained variance related to alcohol-related harms is sexual orientation, which is a known predictor of alcohol and other drug use in adolescents (29–31).

Sexual orientation describes an individual's sexual, psychological and emotional feelings of attraction toward others. Sexual orientation can also be used to describe one's sexual self-identity, and patterns of sexual behaviour. Sexual orientation exists along a continuum, ranging from people who are only attracted to those of the opposite sex to those who are only attracted to the same sex, and including all those who have varying emotional and/or physical attractions to people of the same and opposite sex. Sexual orientation does not always align with sexual activity or sexual behaviour, and many social, cultural, political and religious factors may impact the extent to which an individual will self-identify as a sexual minority (32). Between 2% and 10% of individuals in North America are of non-heterosexual orientation (33). A survey of

105,000 students in the Toronto District School Board found that 8% of those in grades 9-12 identified as non-heterosexual or questioning their sexual orientation (34). In Atlantic Canada, 6% of students in grades 9, 10 and 12 report being lesbian, gay or bisexual (35). Measuring sexual orientation in the context of substance use surveys is discussed further in section 1.5.

A meta-analysis of substance use and sexual orientation concluded that LGB teens from several countries including the U.S.A, Australia and Canada were 1.9 times more likely than their heterosexual counterparts to be engaged in any substance use (36). The overall odds ratio for any alcohol use for youth of non-heterosexual orientation compared to heterosexual youth was 2.55 (based on five studies which addressed this association). The odds of any substance use were 340% higher for bisexual youth (of both genders) and 400% higher for non-heterosexual female youth (36). Despite this being established, no study has been undertaken in high school students to examine variation in alcohol-related harms between different sexual orientations. Furthermore, none of the studies included in this meta-analysis controlled for the effects of variables that might explain some of the relationship between sexual orientation and substance use (36).

In adult populations, lesbians have been found to be at a higher risk for heavy drinking and alcohol-related problems than heterosexual women, while gay men do not appear to be at a higher risk for alcohol-related problems than their heterosexual counterparts (26). This review was limited in the fact that it did not address other sexual identities, most importantly bisexuality. In a sample spanning four countries and a wide age range (12-55 years old), mostly heterosexual females consistently reported more substance use than

heterosexuals. Comparisons with female bisexuals, as well as comparisons of male mostly heterosexuals to other sexual orientations, were less consistent (37). In college samples, levels of binge drinking are slightly lower in gay men than heterosexual men (23,38). Studies examining binge drinking in college women have less consistent results, with some studies finding that bisexual and lesbian women both exhibit higher levels of binge drinking (26), some finding that only bisexual women are at a higher risk (39,40), and some finding no significant difference in risk of binge drinking by sexual orientation (41). This phenomenon may be explained by the fact that elevated levels of binge drinking in college culture may cancel out the typical sexual orientation differences; however, the other harmful consequences of drinking are rarely studied in this context (38).

In 2011, Duryea and Frantz (23) conducted an examination of the consequences of drinking by sexual orientation in a national sample of college students in the United States. Bisexual and heterosexual males 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 while under the influence of alcohol. When examining a mean index of all alcohol-related harms studied among high-risk drinkers, bisexual females had higher levels of alcohol-related harms than both their heterosexual and lesbian counterparts. Bisexual and heterosexual males both had higher levels of alcohol-related problems than their gay counterparts. This study did not control for any covariates (23). These differences highlight the necessity to take sex and sexual orientation into account in research pertaining to alcohol and its related harms. These findings cannot necessarily be applied

to high school students, most of whom have not yet reached the legal drinking age of 19 in Atlantic Canada. Generalizing study findings in university students to high school students is also problematic due to differing cultures surrounding alcohol in each environment, where alcohol is more widely used and accepted in university (42). For example, 62.7% of Canadian university students reported binge drinking compared to 46% of Canadian students in grade 10-12 (8). Furthermore, these findings cannot be generalized from the United States to Canada due to differing alcohol policies, most notably differing legal drinking ages (21 in the United States) (43).

There is currently only one published study that examines alcohol-related harms in a Canadian high school population. This study, conducted by Homma *et al.* in 2012 (24), examines the relationship between substance abuse and sexual orientation among East and Southeast Asian adolescents in British Columbia, Canada. Homma *et al.* focus on the group of adolescents who identify as "mostly heterosexual," noting that they have different patterns of health risk behaviours than both heterosexual and other LGB adolescents (24). They are also an important population to study, as a 2014 review estimated that approximately 7% of individuals identify as mostly heterosexual – outnumbering all other non-completely heterosexual identities (37). If the study participants indicated that they had experienced one or more of thirteen possible problems related to alcohol or drugs over the past 12 months, they were considered as having experienced any harm. Mostly heterosexual female students were found to be 2.09 times more likely than their heterosexual counterparts to experience any harm from alcohol or drugs. No significant difference was observed between heterosexual students and LGB students of either sex (24). The categorization of LGB students in this study was limited

in that it combined lesbian, gay and bisexual students together as one group for analysis, ignoring the clear differences that have previously been shown to exist between those of non-heterosexual orientation with respect to alcohol use. While this study provided a glimpse at of the odds of experiencing *any* harm, it did not take into account the fact that certain harms may be more likely to occur based on sex and sexual orientation (23). 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 (44). Some of the few other studies that have examined health behaviours of mostly heterosexual adolescents found both boys and girls were more likely than their heterosexual peers to report binge drinking (45) and lifetime tobacco use (46).

The studies conducted by Homma *et al.* (24) and Duryea & Frantz (23) are currently the only ones of their nature in a young population, and are both limited in the fact that they examine only crude associations, failing to address potential risk and protective factors outside of sex and sexual orientation.

1.5 Sexual Orientation in Substance-Use Surveys

Lesbian, gay and bisexual individuals are at a higher risk for substance use and harm related to substance use; however, sexual orientation is rarely included in this body of literature (29,47). A systematic review conducted by Flentje *et al.* indicated that sexual orientation was included in the substance abuse literature 3.0% and 4.9% of the time in PsycINFO and PubMed articles in 2007, respectively. Reporting practice had not improved significantly by 2012, where 2.3% and 6.5% of sample articles included sexual

orientation in PsycINFO and PubMed, respectively (29). An overwhelming portion of the current literature is missing an important predictor that could account for variability in substance use patterns. This is even more evident in the adolescent population, where no current studies in Canada or elsewhere give a detailed report of alcohol-related harms by sexual orientation. Given that 6% of adolescents in grades 9, 10 and 12 in Atlantic Canada reported LGB identity in 2007, it is crucial to include sexual orientation measures in this research (35).

Sexual orientation can be challenging to measure in surveys, as it is a multi-dimensional and fluid construct (29,48). This is especially true during adolescence, as sexual identity development and exploration is often characteristic in this period (49). Though no universal consensus has been reached on the best method for measurement, at minimum one measure of identity (the category with which one identifies: heterosexual, lesbian, gay or bisexual), behaviour, or attraction can be included (50). Further expanding upon the aforementioned four categories frequently used in surveys, it is advised to include "mostly heterosexual," "mostly homosexual," "asexual" and "unsure" as possible sexual orientation measures (49). The few studies that include a mostly heterosexual identity option suggest that this group outnumbers all other LGB adolescents, and exhibits different substance use patterns and protective factors (49,51). Approximately one-third of students who identified as bisexual in a three category measure (homosexual, bisexual or heterosexual) went on to choose "mostly heterosexual" or "mostly lesbian/gay" in a five category measure (52). Other surveys include all three of self-reported attraction, behaviour and identity measures, as substance use behaviours can vary depending on which component of sexual orientation is being measured (53). The best practice is to

include all three dimensions; however, in extensive surveys where students are already burdened by many items, three sexual orientation questions may be difficult to justify (51). It is thus important to examine the merit of all three measures with respect to substance use and related harm in adolescents.

Given the stigma associated with being of non-heterosexual orientation, adolescents may be less likely to identify as such in surveys, even when assured the results will be anonymous (51,54–56). This also depends on which measure of sexual orientation is included in the survey: attraction, behaviour or identity. When examining eight school-based surveys, Saewyc *et al*. (51) found that sexual behaviour measures may miss some adolescents of non-heterosexual orientation, as the majority of adolescents had not yet been sexually active. Identity measures may be affected by cultural variation in orientation labels, which in turn may misattribute adolescents or cause skipped responses. Identity measures also may miss some adolescents of non-heterosexual orientation, as self-labelling often comes after attraction and/or behaviour has already been established (57). Sexual minority adolescents who self-label may be better adjusted than their peers who may already recognize same-gender or both-gender attractions, but are still are still struggling with their identity. Including an attraction measure is likely to capture the highest number students of non-heterosexual orientation, thus capturing more adolescents who may potentially be at risk for substance use and related harms (51).

In smaller surveys, explicit questions regarding sexual orientation may not be included due to the assumed lack of statistical power as the base rate of non-heterosexuality in the population is relatively low (58). Other limitations of sexual orientation measures in

substance use surveys include selecting nonprobability samples, and lumping together all non-heterosexual individuals into one category for analysis in order to increase power (47). It is important to draw LGB and heterosexual youths from the same or comparable populations to ensure proper comparisons, while amalgamating all non-heterosexual individuals does not consider that the impact of risk or resilience factors on well-being may differ by subcategory (47,59).

1.6 Minority Stress Theory, Depression and Anxiety

In 1995, Meyer proposed the Minority Stress Theory to explain elevated rates of substance use in the lesbian, gay and bisexual (LGB) community. He proposed that people of non-heterosexual orientation are subject to chronic stress and anxiety related to their stigmatization (60). In 2003, Meyer expanded upon this theory, identifying several LGB-specific stressors: experience of prejudice, rejection or discrimination, hiding and concealing one's sexuality and internalized homonegativity (the internalization of negative societal attitudes on non-heterosexual identities) (61). This theory is supported by many studies. For example, Bontempo and D'Augelli (62) found that LGB students reported higher levels of alcohol use than their heterosexual counterparts; however, these differences were significantly larger when LGB students experienced more incidents of victimization at school. These high levels of stress can also result in many other negative behavioural health outcomes; for example, Haas *et al.* (63) found a rate of suicide among LGB youth five times higher than the rate among comparable heterosexuals.

Minority stressors unjustly continue in today's society, despite the fact that almost 20 years ago, in 1996, the Canadian Human Rights Act formally included sexual orientation

among the prohibited grounds of discrimination (32). A 2011 national survey found that several minority stressors were prevalent in the lives of LGBT youth: 32% of female and 20% of male sexual minority students reported being verbally harassed about their sexual orientation at least once weekly, and 21% of LGBT students reported being physically harassed or assaulted about their perceived sexual orientation or gender identity (64). As of 2011 in the United States, 31 states had explicit laws criminalizing sexual orientation-motivated violence or intimidation (65). Despite this fact, a 2009 national study of LGBT youth in the United States found that nearly 85% of these students had experienced verbal harassment at school, and that 40% had experienced physical harassment at school (66).

Levels of minority stress are not necessarily consistent across differing sexes and sexual orientations (59). A meta-analysis conducted by Kite and Whitley showed that in the United States and Canada, societal attitudes toward homosexuality are less negative toward women than toward men (67). Heterosexual men were shown to report particularly negative attitudes toward gay men (67). Lowering negative societal attitudes may plausibly lead to lower levels and expectancies of discrimination, lower levels of minority stress and in turn lower levels of maladaptive coping mechanisms such as dangerous substance use (59). Conversely, Meyer posited that lesbian and bisexual women might experience higher levels of minority stress due to their "double minority" status (sex and sexual minority) (60,61). Furthermore, studies have found that bisexual individuals reported higher levels of internalized homonegativity (68), were less open about their sexual orientation than lesbian and gay individuals (55) and had lower levels of LGB community involvement (55,68). These characteristics suggest that bisexual individuals (women in particular) may be more vulnerable to harmful substance use as a

stress-coping mechanism (59). A recent review of those who identify as mostly heterosexual found that both males and females were more likely than their heterosexual counterparts to internalize problems. Mostly heterosexual females in particular reported more mental health and substance use problems (37).

Minority Stress Theory is especially important in the context of LGB adolescents. This group faces both the traditional challenges of adolescence along with a potential for increased stress associated with identifying as a sexual minority (30). In addition, LGB youth experience significant challenges when coping with these stressors. Two manifestations of minority stress are heightened anxiety levels and suffering from depression (24,69). Increased rates of these psychosocial difficulties have been reported among LGB adolescents, which are in turn related to substance misuse (70).

Depression and anxiety have previously been shown to be related to several prominent LGB-specific minority stressors. A 2010 meta-analysis conducted by Newcomb & Munstanski found small to moderate associations between internalized homophobia, depression and anxiety (71). In a minority stress model constructed by Lehavot & Simoni using structural equation modeling including victimization, concealment and internalized homophobia, experiencing minority stress was related to experiencing depression and anxiety (31). Though they are not direct measures of specific minority stressors, the inclusion of depression and anxiety in statistical models could plausibly act as an indirect measure of experiencing minority stress.

The association between hazardous alcohol use and depression in the general population has been previously documented (72). This association is most commonly explained by the self-medication hypothesis, which states that individuals use alcohol to self-medicate and alleviate depressive symptoms, placing them at a higher risk for hazardous consumption (73). This is consistent with using coping mechanisms to alleviate minority stress, which may partially account for heightened alcohol use among LGB adolescents (24). Hazardous drinking can, in turn, heighten depressive symptoms, as explained by the impaired-functioning model. The impaired-functioning model also hypothesizes that using alcohol as a coping mechanism may harm personal relationships, increase the risk of accidents and increase vulnerability to victimization (73). Both the self-medication hypothesis and the impaired-functioning models have been used to explain the association between alcohol use and anxiety as well (73). Social anxiety in particular is associated with an increased risk of experiencing negative consequences related to consuming alcohol in college students (74).

Associations between hazardous alcohol use and both depression and anxiety are more common among university aged women than men (75); however, this association has not been investigated in relation to sexual orientation and alcohol-related harms in a high school population. Both depression and anxiety may significantly impact the relationship between sex, sexual orientation and alcohol-related harms.

1.7 The Role of Parental and School Connectedness

School connectedness is a psychosocial indicator of "the extent to which students feel personally accepted, respected, included and supported by others in the school social

environment" (76). Stress-buffering theory purports that social supports such as school connectedness may moderate or "buffer" some of the negative impacts of stressors on adolescent health (77). Given the heightened level of stress associated with non-heterosexual orientation as outlined by the Minority Stress Theory, school connectedness is a factor of interest for LGB adolescents. In fact, it has been established that school connectedness is particularly important for minority youth who are at an increased risk for feeling alienated or isolated from others, including those who have established their sexual orientation as lesbian, gay or bisexual, as well as those who continue to question their sexual orientation as they develop (54,78). Sexual minority youth disproportionately report negative academic outcomes, not feeling safe at school and not belonging at school, which are all important elements in measuring school connectedness (79,80).

Adolescents spend a significant portion of their time in schools, making this social hub a key factor in whether they are at risk for, or protected from, various negative health outcomes (2,81). Schools play an important role in establishing social norms. Catalano and Hawkins propose in their Social Development Model that behaviours that do not align with those valued by adults that students feel connected to in school are less likely to occur in those who identify a strong bond to their school environment (82,83). For this reason, school connectedness has been identified as an important protective factor against negative health outcomes for adolescents (84).

Overall, students who report feeling less connected to their schools are more likely to engage in sexual risk behaviours (85), substance abuse (86) and violence (85), and are more likely to report symptoms of depression (2) and suicidality (87). Blum *et al*.

identified school connectedness as the strongest protective factor against health-compromising behaviour in Caribbean youths (88). Individual levels of school connectedness can be captured by examining several qualities of the student, including their personal sense of belonging to a school, their like or dislike of school, perception of teachers, perception of safety at school, having friends and social connections at school, valuing and being engaged in academics, and participating in extracurricular activities (89).

Promoting school connectedness in high schools is especially important, since a sense of school connectedness in youth tends to decrease with age (90). This is contrasted by the fact that school connectedness becomes more important with age, as adolescents begin to rely on others in their social environment more than those in their family environment (2). School connectedness can potentially be strengthened at the school-level in order to benefit individuals. School staff (teachers, administration, coaches, lunchroom services, counsellors, etc.) play an important role in enhancing individual school experiences: as noted in *School Connectedness: Improving Students' Lives,* "people connect with people before they connect with institutions" (89).

Training materials are available for these staff to promote and develop school connectedness (notably, "School Connectedness: Strategies for Increasing Protective Factors Among Youth" produced by CDC USA 2009) (91). These strategies range from simple short-term changes to broader long-term changes that may require administrative or budgetary changes. School populations are diverse, and in order for everyone to feel connected and supported, the school environment, personnel and curricula must reflect

that reality (91). Given the protective associations of school connectedness with multiple negative health outcomes, targeted intervention strategies may be warranted (91). Minority youth, such as those that identify as LGB, are in a position to benefit most from targeted interventions, as they may have lower baseline levels of school connectedness (78). Patterns of adult substance use are also often established during adolescence, making this period an ideal time to introduce feasible interventions (7).

Parental connectedness also plays an important role in mediating adolescent health risk behaviours (92). Parental connectedness is a broadly defined concept based on self-reported feelings and perceptions. The extent to which an adolescent feels loved, cared for and close to their parents is captured through this concept. Several other constructs are similar in nature, including connection, family cohesion, attachment and closeness; however, they all address the presence of a strong emotional bond and close relationship between parent and adolescent (93).

Catalano and Hawkins' Social Development Model also purports that adolescents learn patterns of behaviour from parents and communities, in addition to the previously discussed peer and school contexts. According to this model, stronger social supports at home, and adults who model positive behaviours should decrease the prevalence of risk behaviours in adolescents (83). This notion has been tested by Resnick *et al*., who found that similarly to school connectedness, parental connectedness was significantly and inversely associated with outcomes such as suicidality, alcohol use and marijuana use (85). Recent studies suggest that parental connectedness is especially important in LGB youth, where poor health-related outcomes are related to lower reported levels of family

connectedness (94,95). LGB youth may experience lower levels of family connectedness than their heterosexual counterparts, in part due to the minority stress they may experience due to their sexual orientation. Some causes of a loss of connectedness between LGB youth and their parents include parental rejection of sexual orientation, stress related to "coming out," and general negative attitudes toward homosexuality in the home environment (95).

Though the roles of school connectedness and parental connectedness have been examined with a variety of health outcomes, no such study has examined their role in the relationship between alcohol-related harms, sex and sexual orientation. Given the heightened levels of alcohol use among LGB adolescents and the protective association of parental and school connectedness with alcohol use, the potential role of these protective factors against alcohol-related harms is a research priority.

1.8 Statement of Rationale

Given the high rates of alcohol misuse in adolescence, it is important to study the negative consequences related to drinking to develop appropriate targeted interventions. Furthermore, patterns of adult substance use are frequently established during adolescence, making this period ideal for early intervention strategies. Variability in substance use patterns has been observed across sex and sexual orientation. This variability is also observed in patterns of alcohol-related harms in young college drinkers (23), and East and Southeast Asian high school students in British Columbia, Canada (24). To date, no study has examined the sex and sexual orientation differences of

individual harms amongst high school students. Furthermore, no study has examined whether high school students are at risk for a greater number of alcohol-related harms based on their non-heterosexual orientation. Anxiety, depression, parental connectedness and school connectedness have all been identified as important factors to consider when examining negative health outcomes in adolescents. Despite this fact, no such study has examined their role, or the role of other demographic covariates, in connection with alcohol-related harms when factoring in sexual orientation. Given the strong positive influence of school connectedness and parental connectedness in the lives of adolescents, and the need to fill a gap in the literature, this association requires investigation.

1.9 Study Objectives

Given the gap in the literature relative to alcohol-related harms, sexual orientation and psychosocial indicators in high school students, the present study seeks to address the following three primary objectives.

To determine whether, among adolescents attending high school in Atlantic Canada:

1) sexual orientation is associated with experiencing alcohol-related harms, including
   (a) **any (one or more)** of nine specific alcohol-related harms;
   (b) **a higher count** of such alcohol-related harms; and
   (c) **specific** alcohol-related harms;

2) any discovered bivariate associations between sexual orientation and harm hold after controlling for many factors, including five psychosocial indicators: depression, anxiety, school connectedness, parental connectedness and sensation seeking, and,

3) any of a range of covariates is/are associated with experiencing one or more alcohol-related harms.

Chapter 2: Methods

2.1 Study Design

The present 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 (NFLD). Prince Edward Island was not included in the 2012 iteration as it had been in previous years. A standardized protocol was developed in 1994, and this is the fifth iteration of the survey. The 2012 survey consisted of 106 multiple-choice items and one open-ended feedback question. Paper-based surveys were delivered in English or French, depending on the primary language of school instruction. Responses to all questions were self-reported and therefore cannot be independently verified. More detailed information concerning the survey design and methods can be found in the three provincial reports (96–98).

2.2 Ethics Approval and Consent

The Dalhousie University Health Sciences Research Ethics Board (DUHSREB) granted ethics approval for the 2012 survey. Ethics approval was also obtained in December 2015 for the present secondary data study through DUHSREB. Initial approval for participation was obtained from each provincial Department of Education in conjunction with the Department of Health and Wellness. The Superintendent of each school board was asked for their approval of the project, and to contact schools in their board with a letter of support. Principals in the schools randomly selected to participate were contacted to

obtain approval for their school to take part in the survey. Individual schools determined the requirement for individual parental/guardian consent. Only in the Halifax Regional Municipality was parental consent required for students' participation. The cover page of the survey provided information about the purpose and goals of the survey, as well as its anonymous, confidential and voluntary nature. Student consent was implicit in their completion of the anonymous survey, regardless of the requirement for parental/guardian consent.

2.3 Study Population

The primary ASDUS study sample consisted of students in grades 7, 9, 10 and 12 in the public school system in the three participating provinces. Students in both Anglophone and Francophone schools were included in the sample. Excluded were students in private schools and schools on reserves, street-youth, school-leavers and students in classes selected to participate who were absent on the day of the survey.

The sample design employed was a two-stage stratified cluster sample. First, schools were randomly selected from within each of the four Shared Service Areas in NS, four School Districts in NFLD and Seven Health Districts in NB, then classes containing over 20 students in one of the four surveyed grades were selected. The sample allowed for approximate 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.

A total of 9,226 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.

Students in grade 7 and students under the age of 14 were also excluded for several reasons. Firstly, this study aimed to examine high school students, who are typically defined as students in grades 9-12. Secondly, 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) (99). In order to more accurately capture sexual orientation and in order to apply the theory of Normative Social Behaviour in the theoretical framework, the present study examined data from students in grades 9-12 (typically ages 14-19) (100). Alcohol use is also low in grade 7 students in Nova Scotia, with only 3.6% reporting alcohol use more than once per month, compared to 21.5% of those in grade 9, 30.4% of those in grade 10 and 47.9% of those in grade 12 (96).

Students in grades 9-12 who did not report any past-year history of alcohol consumption were excluded from alcohol-related harms analyses, as alcohol consumption is a prerequisite for directly experiencing the harms of interest (which are assessed over the past 12 months). Past-year alcohol consumption was assessed in question 28 of the ASDUS: *In the past 12 months, how often did you drink alcohol – beer, wine, coolers or hard liquor (rum, whisky, vodka, gin, etc.)?* Students who responded "Not at all" were excluded from the main analyses. Finally, in the present study, the responses of all

students who reported using a fictitious drug were excluded. This question was included in the original survey to detect students not responding in an honest and trustworthy fashion.

2.4 Measures

A detailed overview of how variables are coded in the original 2012 ASDUS dataset, as well as how they were coded for the present secondary data analysis study can be found in Appendix B.

2.4.1 Alcohol Use

In order to determine drinker status, and as part of supplementary analyses, an alcohol use variable was derived among all grade 9, 10 and 12 students who met the inclusion criteria outlined in section 7.3. Two alcohol use measure variables were included in this analysis: any alcohol use (past 12 months) and any binge drinking (past 30 days).

Any alcohol use in the past 12 months was assessed in question 28 of the ASDUS. Students who indicated any alcohol use were assigned a value of 1, those who indicated no use were assigned a value of 0, and those with a missing response were excluded from analyses.

Bellis *et al.* (20) reported that alcohol-related harms in adolescents increase for those who binge drink. For the purposes of analyses, binge drinking was defined as having five or more drinks on the same occasion, at least once over the past 30 days. Binge drinking, assessed in question 71, was thus dichotomized to no (=0, “I did not drink alcohol at all in

the past 30 days" and "I have not had five or more drinks of alcohol on the same occasion in the past 30 days") and yes (=1, binge drank ≥1 time(s) in the past 30 days).

2.4.2 Alcohol-Related Harms

The ASDUS collected information on nine consequences related to alcohol consumption, all of which were investigated in order to gain a picture of overall harm in the study sample. These alcohol-related harms are:

- 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
- Driving under the influence of alcohol (with or without a collision)
- Unplanned sex under the influence of alcohol or drugs

As noted in section 4.2, youth can experience alcohol-related harms without personally consuming alcohol; however, for the purposes of this study, experiencing alcohol-related harm referred to those who have experienced harms while personally under the influence of alcohol. All harms were assessed in terms of the past 12 months.

Seven of the nine harms of interest were assessed as "yes" "no" or "I do not drink alcohol." Unplanned sex under the influence of alcohol or drugs was assessed as "yes" or

"no," and drinking and driving was assessed by frequency (never to three or more times), including an "I do not drink alcohol/I do not drive" option. These responses were recoded to no (=0) or yes (=1) in order to capture experiencing *any* instance of that particular harm.

Any_harm: In order to first determine whether sexual orientation (and the other covariates of interest) was associated with ***any*** experience of alcohol-related harm, a dichotomous outcome variable labeled as "any_harm" was created. If a respondent answered "yes" to any one (or more) of the nine alcohol-related harms included in analyses, they were assigned a value of 1, even if they had missing data related to other harms. If a respondent did not answer "yes" to any of the nine alcohol-related harms, and did not have any missing data related to any of the harms of interest, they were assigned a value of 0. Those with missing data that did not answer "yes" to any questions were excluded from analyses, due to the inability to ascertain their harm status.

Harms_count: Next, the study analyses assessed whether sexual orientation (and the other covariates of interest) was associated with experiencing ***a higher count*** of alcohol-related harms. A count outcome variable labeled "harms_count," was created, which only included respondents who responded to all nine alcohol-related harm questions. The dichotomous responses to each of the nine individual harm items were summed to create a count of 0 to 9, with a higher count indicating that the respondent experienced a greater number of alcohol-related harms.

Finally, to determine whether ***individual*** harms were associated with sexual orientation (and other covariates of interest), any individual harm with over 10% prevalence in the

study sample was examined, by sex. For males, harms with over 10% prevalence were damage to property, self-injury, driving under the influence, and unplanned sex under the influence of alcohol or drugs. For females, harms with over 10% prevalence were tensions or disagreements with family and/or friends, affected spending, damage to property, self-injury and unplanned sex under the influence of alcohol or drugs. A 10% prevalence cut-off was used to ensure sufficient power to detect differences between sexual orientation groups in analyses for more prevalent harms.

2.4.2 Sex and Sexual Orientation

Sex was assessed in the ASDUS by asking the following question: "*Are you male or female?"* Certain alcohol-related harms have previously been shown to occur disproportionately by sex and sexual orientation in college samples (23). Because the effects of sexual orientation on alcohol-related behaviours is likely different by sex, which is strongly related to the risk of alcohol-related harms, all models were stratified by sex.

Sexual orientation was measured with the following question (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 responses were provided as options: "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 (51).

2.4.3 Covariates

A lack of control for possible confounding variables in the alcohol use-sexual orientation relationship has been identified as a weakness in the current body of literature (36). As such, a number of covariates previously shown to be associated with alcohol use, alcohol-related harms and/or sexual orientation were considered during analyses. All variables that were included in analyses were collected on the level of the individual respondent.

Grade: Grade was measured categorically by asking respondents: *"What grade are you in?"* It has been established that increasing age is associated with increased alcohol use and alcohol-related harm as well as increased sexual identity exploration in adolescents (99,101). Grade (9, 10 or 12) was included as an indirect measure of age, as it has more implications for school-based alcohol prevention and education strategies.

Academic Achievement: Higher academic achievement has previously been shown to be associated with less frequent alcohol use (102). The relationship of academic achievement and alcohol use is complex. Increased alcohol consumption is associated with statistically significant reductions in GPA in some populations, as well as more self-reported academic difficulty (an alcohol-related harm of interest) (102). In turn, students who do well in school were less likely to engage in risky behaviours (91). Self-reported academic achievement was coded as <80% and ≥80% to reflect Azagba's treatment of similar data (103).

Socioeconomic Status: Indicators of higher socioeconomic status (SES) have previously been shown to be protective against risky substance use and related harm among adult

sexual minority populations (104). In young populations, however, high socioeconomic status was also found to be associated with increased binge drinking, which may lead to increased harm (40). SES was measured on a ladder from "worst off" to "best off" (range 1-10) in the ASDUS. Based on previous studies, SES was categorized into low SES (scores of 1-4), middle SES (scores 5-7), and high SES (scores 8-10) (105).

Religiosity: Importance of religion may act as a protective factor against alcohol-related harms (13,26). A dichotomous variable (low vs. high religiosity) was created for analysis based on student's answers to the following question: *"how important would you say religion is to you?"* Low religiosity combined those who responded "not at all important" and "not very important" and high religiosity combined those who responded "fairly important" and "very important" (2).

Cannabis Use: When cannabis was used concurrently with alcohol, the odds of drinking and driving, harms to self and social consequences in Americans aged 18 and older, doubled (106). It has been established that those of non-heterosexual orientation are more likely to engage in various forms of substance use, including cannabis (36). Cannabis use was dichotomized to no, "I did not use cannabis in the past 12 months" and yes, (used ≥1 time(s) in the past 12 months) for the purpose of analyses.

Self-Rated Health: Poor self-rated health is associated with non-heterosexual orientation as well as an array of adverse outcomes (107). Self-rated health was dichotomized to reflect those with "poor or fair" and "good or above" health status (105).

Sensation Seeking: Sensation seeking is related to alcohol use in that alcohol use often increases positive arousal. Individuals with higher levels of sensation seeking thus may meet their strong need for varied and intense simulation by consuming alcohol until they reach optimal arousal. This may lead to overconsumption, which is associated with

alcohol-related harms (108). Sensation seeking was measured with the four-item Brief Sensation Seeking Scale "BSSS-4" (Cronbach's alpha = 0.83) in the ASDUS. Each item is rated from 1 to 4 ("strongly agree" to "strongly disagree"), with responses being reverse-coded and summed to derive a continuous variable (range 4 to 16) where a lower score indicates lower sensation seeking. Although there is no universally accepted cut-off point for the BSSS-4, previous studies have dichotomized the score using a high cut-off of one standard deviation above the mean score (109). This cut-off point was used for the present study, with any score below the cut-off indicating low sensation seeking, and anything above the cut-off indicating high sensation seeking.

School Connectedness: Lower school connectedness is known to be associated with increased health risk behaviours in adolescents, and youth of non-heterosexual orientation may experience lower school connectedness due to experiencing minority stress in school settings (78). School connectedness was assessed with a 3-item scale based on the 5-item scale used in the U.S. National Longitudinal Study of Adolescent Health (110). Students were asked to rate the following statements from 1 (*strongly agree*) to 4 (*strongly disagree*): "I feel safe in my school," "I feel close to people at my school," and "I feel happy at my school." A continuous school connectedness score was calculated by reverse coding and summing these items, with higher score (range 3-12) indicating greater school connectedness. The Cronbach's alpha coefficient for the 3-item scale was 0.74. The continuous score was dichotomized into two categories, lower and high school connectedness, with the cut-off point being set at one standard deviation above the mean score, based on previous studies (111,112).

Parental Connectedness: Parental connectedness or support is frequently included along with school connectedness in studies, as high parental connectedness is correlated with

high school connectedness (85,91). Parental support and feeling connected to parents or guardians also influences social norms around alcohol use, some of which may lead to harm (16). Finally, a lack of parental connectedness in LGB youth may be due to a lack of accepting sexuality, an important aspect of minority stress theory (63). Parental support was measured with a three-item scale in the ASDUS (1 to 5, "strongly agree" to "strongly disagree"), with responses reverse-coded and summed (range 3 to 15). Similar to the sensation seeking and school connectedness variables, parental connectedness was dichotomized by using a high cut-off point of one standard deviation above the mean. Anything above this point was considered "higher connectedness" and anything below was considered "lower connectedness."

Anxiety: Anxiety is related to higher levels of minority stress and alcohol use, which are both in turn related with being of non-heterosexual orientation (113). Anxiety was measured with the five-item SCARED scale in the ASDUS (1 to 3, "not true" to "often true"), with responses summed to yield a scale range of 5 to 15. The Cronbach's alpha coefficient for the 5-item scale in the study sample was 0.68. Based on previous measures, the scale was dichotomized, with a score of 8 or more indicating the possible presence of an anxiety disorder (114).

Depression: Depression is associated with both being of non-heterosexual orientation and engaging in hazardous substance use (72,73). Depression was measured using the 12-item version of the Center for Epidemiological Studies-Depression Scale (CES-D-12) (115). The CES-D-12 (Cronbach alpha = 0.81) identifies three categories of depressive systems: minimal (scores 1 to 11, coded as 1), somewhat elevated (range 12 to 20, coded as 2) and very elevated (scores 21 to 36, coded as 3) (2).

2.5 Statistical Analyses

2.5.1 Main Analyses

All analyses took into account the stratified disproportionate cluster sample design and probability weights. Respondents with missing data related to the primary outcomes and exposures of interest were excluded from related analyses. Missing data from item non-response for covariates was addressed by including a missing category in affected variables. Any one item missing from a scale qualified the respondent for an "indeterminate" categorization for that particular scale.

All data were analyzed using Stata V.13.1 (StataCorp, College Station, TX) software. Significance levels were set at $\alpha=0.05$, unless otherwise indicated. All statistical models were stratified by sex. In all analyses, heterosexual orientation was the referent category.

An initial descriptive analysis was conducted to examine the distribution of all variables of interest, stratifying by sex. Categorical variables were described using unweighted frequencies, and weighted proportions with 95% confidence intervals (CI) for this portion of the analyses. This analysis included employing chi-square tests to determine if there was an association between sex and alcohol-related harms, to confirm whether a sex stratified analysis was justified. The distribution of covariates by sex and sexual orientation was also briefly described using unweighted frequencies, and chi-square tests.

Unadjusted associations between sexual orientation and (a) any harm and (b) specific individual alcohol-related harms with over 10% past 12-month prevalence, were

examined using logistic regression. The unadjusted association between sexual orientation and count of alcohol-related harms was examined using negative binomial regression.

After the bivariate associations between the any harm variable and each covariate were determined, any covariates associated at the $p<0.10$ level were included in a backward stepwise modelling process to identify confounders of the association between alcohol-related harms and sexual orientation, using multiple logistic regression. All covariates that changed the odds ratio (OR) for the association between sexual orientation and any alcohol-related harm by a minimum of 20% were left in the model in order to arrive at the most parsimonious model. These covariates were also included in the final adjusted models for the other alcohol-related harm outcomes.

Finally, in order to model the overall odds for alcohol-related harm and address the third objective, any covariate that was associated with the any_harm variable at the $p<0.10$ level in bivariate models was included in an exploratory logistic regression.

2.5.2 Supplementary Analyses

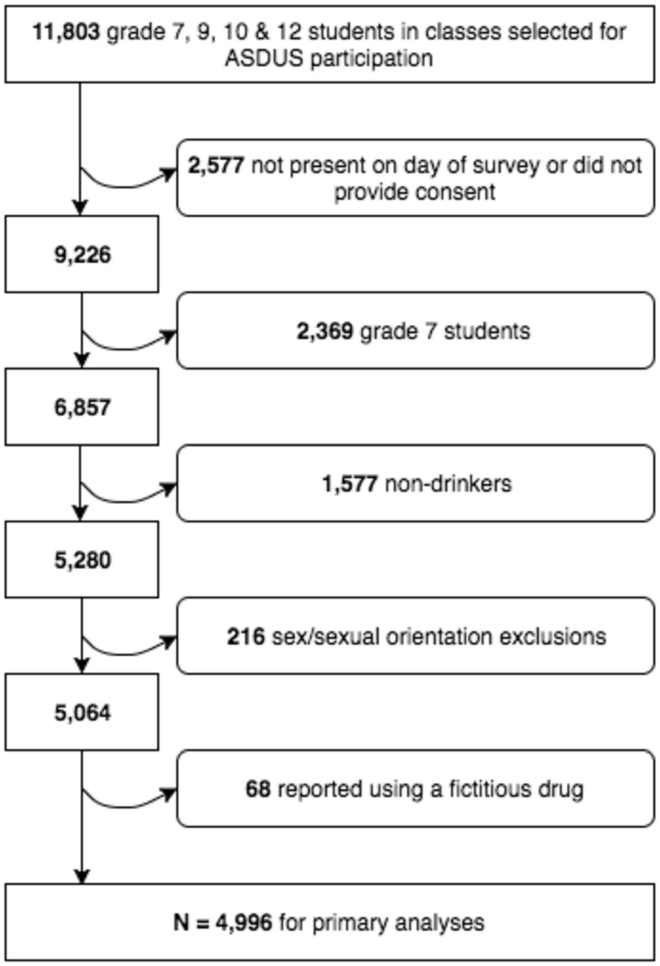
In order to examine whether any alcohol use in the previous twelve months was associated with sexual orientation, unadjusted logistic regression modelling was employed among all high school students (grades 9, 10 and 12) with valid responses (both drinkers and non-drinkers). This process was repeated to determine whether binge drinking was associated with sexual orientation.

Chapter 3: Results

3.1 Descriptive Analyses

Descriptive statistics were calculated for all variables included in the study. The study sample refers to high school students (grades 9, 10 and 12) who reported consuming any alcohol over the past 12 months, and had valid responses. Figure 3 explains the process of arriving at the final study sample (N=4996), beginning with the initial selection of students for the ASDUS study sample (N=11803).

Figure 3. Flow diagram showing the exclusion process from initial ASDUS participant selection to the primary study sample.



3.1.1 Sexual Orientation, and Other Covariates

Unweighted frequencies, and weighted percentages with 95% confidence intervals (CI) are presented for all variables included in the study in Table 2a, by sex.

Slightly less than half of the students were male (46.7%), with a mean age of 16.0 years. Among males, the majority of respondents identified their sexual orientation as heterosexual (88.6%), with the least common response being mostly homosexual (0.7%). The percentage of males in grades 9, 10 and 12 ranged between 27.8% and 37.6%. The majority of males indicated that they came from families of middle socioeconomic class (59.0%), had an academic average less than 80% (55.2%), considered religion of lower importance (71.8%) and rated their health status as good or above (90.2%).

Slightly more than half of the students were female (53.3%), with a mean age of 16.1 years. Similar to male respondents, the majority of females identified their sexual orientation as heterosexual (79.6%), with the least common response being mostly homosexual (0.6%). The percentage of females in grades 9, 10 and 12 ranged between 25.7% and 42.0%. The majority of females indicated that they came from families of middle socioeconomic class (53.6%), had an academic average of 80% or above (53.3%), considered religion of lower importance (62.9%) and rated their health status as good or above (89.0%).

The distribution of several psychosocial covariates differed between males and females. A higher proportion of females reported somewhat elevated (32.7%; 95% CI 29.9%-35.7%), and very elevated (13.8%; 95% CI 11.9%-16.0%) depressive symptoms than

males (somewhat elevated 20.1%; 95% CI 17.8%-22.6%; very elevated 4.4%; 95% CI 3.4%-5.8%). Similarly, a higher proportion of females screened positive for an anxiety disorder (38.6%; 95% CI 35.9%-41.3%) relative to males (13.7%; 95% CI 11.7%-15.8%). Despite these heightened mental health issues in females compared to males, a higher percentage of females reported higher levels of social support in the form of parental connectedness (17.5%; 95% CI 15.6%-19.5%) than males (12.4%; 95% CI 10.3%-14.0%). There was, however, no significant difference between the proportions of females (9.3%; 95% CI 7.7%-11.3%) and males (12.0%; 95% CI 10.3%-14.0%) who reported high levels of school connectedness.

Tables 2b (males) and 2c (females) contain a brief overview of the covariates included in the study by sex and sexual orientation, using unweighted frequencies. All covariates were associated with sexual orientation among males with the exception of religiosity, cannabis use, parental connectedness and school connectedness. All covariates were associated with sexual orientation among females with the exception of school grade.

3.1.2 Past 12-Month Prevalence of Alcohol-Related Harms

The unweighted frequency and weighted percentage (with 95% CI) of respondents who indicated experiencing each of the nine included harms, as well as one or more harms, are included in Table 3.

More than 10% of males reported that they damaged property (17.8%), injured themselves (16.3%), drove under the influence (10.1%), or engaged in unplanned sex (19.0%) as a result of their alcohol use. Among females more than 10% reported that

they experienced tensions or disagreements with family (11.6%), were unable to buy other things (14.2%), damaged property (14.6%), injured themselves, or engaged in unplanned sex (22.7%) as a results of their alcohol use. Among males included in the study sample, 41.7% experienced one or more alcohol-related harms. A slightly higher percentage of females (46.0%) experienced one or more alcohol-related harms, though the difference was not statistically significant.

In order to gain a better idea of the count of harms experienced by males and females in the study sample, a bar graph was created to show the distribution. Figure 4 shows the unweighted frequency of high school drinkers who reported experiencing between 1 and 9 harms. As the count of harms increased, the unweighted frequency of students experiencing that count of harms decreased. The median number of harms for both males (IQR = 0-1) and females (IQR = 0-1) was 0. Both distributions were positively skewed as seen in Figure 4. Males (n=1302) and females (n=1453) who had a 0 count of harms were not included in Figure 4.

3.2 Main Results

The first study objective aimed to determine whether there was a crude association between experiencing any (one or more) alcohol-related harm and sexual orientation, as reported in Table 4a for males and Table 4b for females. Compared to all other sexual orientations, mostly homosexual males had the highest weighted percentage of respondents indicate experiencing one or more alcohol-related harms (57.4%). Mostly heterosexual males were slightly less likely to experience any alcohol-related harms than their heterosexual classmates (OR 0.54; 95% CI 0.30-0.98). Compared to all other sexual

orientations, bisexual females had the highest weighted percentage of respondents who indicated having experienced one or more alcohol-related harms (55.6%). Mostly heterosexual (OR 1.39; 95% CI 1.04-1.86) and bisexual females (OR 1.52; 95% CI 1.001-2.32) were both slightly more likely to experience any alcohol-related harms than their heterosexual classmates. These findings, as well as the differing direction of associations in males and females, justify stratifying on sex.

The adjusted associations between sexual orientation and experiencing any harm are also included in Table 4a for males and Table 4b for females. As outlined in section 7.5.1, a backward-stepwise covariate selection process was conducted to identify confounders of the relationship between harm and sexual orientation. Bivariate associations between each covariate and harm are contained in Table 5, and were used to identify initial covariates for inclusion in adjusted models.

Mostly heterosexual males were less likely than their heterosexual counterparts to experience one or more alcohol-related harms over the past 12 months in adjusted models (OR 0.46; 95% CI 0.26-0.80, Table 4a). Covariates that remained in the final model because they affected the relationship between experiencing any alcohol-related harm and sexual orientation among males were higher sensation seeking (OR 2.43, 95% CI 1.81-3.25), being in grade 12 (OR 3.06; 95% CI 2.14-4.37), any cannabis use (OR 4.22; 95% CI 4.22-6.98) and higher self-rated health (OR 0.57; 95% CI 0.26-1.24).

In adjusted models, females who identified as 100% homosexual (OR 0.09; 95% CI 0.02-0.41) or unsure (OR 0.47; 95% CI 0.22-0.99) about their sexual orientation were less

likely to experience one or more alcohol-related harms in the past 12 months (Table 4b). Covariates that remained in the final model for the relationship between experiencing any alcohol-related harm and sexual orientation among females were higher school connectedness (OR 0.95; 95% CI 0.61-1.48), very elevated depression (OR 2.13; 95% CI 1.49-3.06), higher sensation seeking (OR 1.81, 95% CI 1.34-2.43), grade (grade 12 OR 1.72; 95% CI 1.26-2.34) and any cannabis use (OR 6.50; 95% CI 5.12-8.26). After adjusting for significant covariates, relative to students who identified as heterosexual, neither males nor females identifying as non-heterosexual exhibited increased odds of experiencing one or more harms.

Further analyses were undertaken to determine if there was any association between the number of alcohol-related harms experienced and sexual orientation (Table 6), and specific harms and sexual orientation (Table 7a for males and Table 7b for females).

As seen in Table 6, there were no statistically significant associations between number of harms experienced and sexual orientation among males in unadjusted models. In adjusted associations, mostly heterosexual (IRR 0.61; 95% CI 0.40-0.91) and mostly homosexual (IRR 0.66; 95% CI 0.44-0.998) males were significantly less likely to experience an increased count of alcohol-related harms compared to their heterosexual counterparts.

Before adjustment, mostly heterosexual females were more likely to experience a higher number of harms (IRR 1.28; 95% CI 1.02-1.61) than their heterosexual counterparts (Table 6). After adjusting for covariates, this association disappeared. Females who were unsure of their sexual orientation were less likely to experience a higher number of harms

than their heterosexual counterparts in both unadjusted (IRR 0.46; 95% CI 0.26-0.80), and adjusted models (IRR 0.50; 95% CI 0.33-0.78).

As shown in Table 7a, both before and after adjustment, mostly heterosexual males were less likely to drive under the influence of alcohol (adjusted OR 0.20; 95% CI 0.07-0.62) and engage in unplanned sex under the influence of alcohol (adjusted OR 0.21; 95% CI 0.08-0.55). Relative to males who identified as 100% heterosexual, males identifying with other orientations were not at increased risk of experiencing specific alcohol-related harms.

Table 7b demonstrates that in crude associations, mostly heterosexual females were more likely to experience tensions or disagreement with family or friends (OR 1.91; 95% CI 1.22-3.01), and to injure themselves (OR 1.50; 95% CI 1.001-2.25) under the influence of alcohol, compared to their heterosexual counterparts. Bisexual females were more likely to engage in unplanned sex (OR 1.62; 95% CI 1.04-2.53) under the influence of alcohol or drugs than heterosexual respondents. After adjusting for covariates, bisexual females were significantly less likely to be unable to spend money on other things due to spending on alcohol (OR 0.43; 95% CI 0.22-0.83). There were no other associations with specific alcohol-related harms and non-heterosexual orientation in adjusted models.

All covariates with the exception of school connectedness and anxiety for males, and religiosity for females, were associated with experiencing any harm at the $p<0.10$ level, as shown in Table 5. These aforementioned variables were excluded from further models due to their lack of significant association with experiencing any alcohol-related harms.

Of all included covariates, cannabis use had the strongest bivariate association with experiencing any harm for both males (OR 6.01; 95% CI 4.67-7.70), and females (OR 7.32; 95% CI 5.77-9.29).

The adjusted associations between each covariate and experiencing any alcohol-related harm are included in Table 8. In adjusted models for males, increasing grade (grade 12 OR 3.12; 95% CI 2.17-4.48), cannabis use (OR 5.15; 95% CI 3.92-6.78) and higher sensation seeking (OR 2.36; 95% CI 1.75-3.17) were associated with an increased odds of experiencing any alcohol-related harm. Middle and high socioeconomic status (higher SES OR 0.51; 95% CI 0.27-0.97), good or above self-rated health (OR 0.46; 95% CI 0.25-0.85), mostly heterosexual orientation (OR 0.41; 95% CI 0.23-0.74), and higher parental connectedness (OR 0.57; 95% CI 0.37-0.90) were protective of experiencing any alcohol-related harms among males. In adjusted models for females, increasing grade (grade 12 OR 1.76; 95% CI 1.31-2.39), cannabis use (OR 6.12; 95% CI 4.78-7.83), higher sensation seeking (OR 1.74; 95% CI 1.30-2.33) and somewhat elevated depression and above (very elevated OR 1.66; 95% CI 1.12-2.45), were associated with increased odds of experiencing any alcohol-related harm. Good or above self-rated health (OR 0.40; 95% CI 0.25-0.65), higher parental connectedness (OR 0.61; 95% CI 0.43-0.87) and 100% homosexual orientation (OR 0.09; 95% CI 0.02-0.34) were protective of experiencing any alcohol-related harms among females.

3.3 Supplementary and Post-Hoc Analyses

3.3.1 Sexual Orientation and Alcohol-Use Patterns

Supplementary analyses were conducted in order to determine whether alcohol use patterns were associated with sexual orientation among all valid respondents in grades 9, 10 and 12. The unadjusted odds ratios of any alcohol use in the past 12 months (with 95% CI) by sexual orientation are reported in Table 9.

Compared to heterosexual males, the odds of consuming any alcohol over the past 12 months was lower for males who were unsure about their sexual orientation (OR 0.47; 95% CI 0.30-0.73). A decreased odds of past 12-month alcohol use was also observed in female respondents who were unsure about their sexual orientation (OR 0.31; 95% CI 0.20-0.48). Females who identified as mostly heterosexual were more likely to consume any alcohol over the past 12 months compared to their heterosexual classmates (OR 1.97, 95% CI 1.23-3.17). Compared to heterosexual males, the odds of binge drinking in the past 30 days was lower for mostly heterosexual males (OR 0.42; 95% CI 0.22-0.81), and males who were unsure about their sexual orientation (OR 0.53; 95% CI 0.31-0.92). A decreased odds ratio for binge drinking in the past 30 days was also observed in female respondents who were unsure about their sexual orientation (OR 0.26; 95% CI 0.13-0.52). Females who identified as mostly heterosexual were more likely to binge drink in the past 30 days compared to their heterosexual counterparts (OR 1.44, 95% CI 1.04-1.99).

3.3.2 Post-Hoc Analyses

Saewyc *et al.* (51) found that in British Colombian adolescents, those who were held back a grade, those with a learning disability and those who spoke a language other than English at home more than half the time were more likely to select "unsure" in survey questions related to sexual orientation. Ethnic and cultural barriers are also related to selecting "unsure" on questions related to sexual orientation. There are four plausible reasons that ASDUS respondents selected "unsure": because they had not experienced any attraction to others, because they were unsure of what category they belonged in, because they truly were questioning their sexual orientation, or they were unsure of the meaning of the question (51). Response set bias may also come into play with those who answer "unsure" to the sexual orientation question. Saewyc *et al.* (51) also found that students were more likely to select "unsure" to other questions, or to have missing responses, than those who selected a sexual orientation category. This may explain some of the protective associations against alcohol-related harms that have been found in this study sample among those who indicated an unsure orientation. Some studies in high school students exclude those who respond "unsure" to survey questions on sexual orientation for these reasons (24).

These assumptions were tested by conducting post-hoc analyses. Although information on learning disabilities was not collected in the ASDUS, this survey did assess language spoken at home. Compared to those of heterosexual orientation, both males (OR 2.05; 95% CI 1.07-3.95) and females (OR 2.89; 95% CI 1.41-5.94) who indicated they were unsure of their sexual orientation were more likely to speak a language other than English at home (including French). Furthermore, males and females (combined due to the small

source population) were more likely to speak a language other than English and/or French at home if they were unsure of their sexual orientation (OR 3.99; 95% CI 1.38-11.5). In order to assess whether those who were unsure of their sexual orientation were more likely to be unsure of other responses, five items were selected at random from the ASDUS (academic average, highest level of mother's education, sub-items of the parent and community connectedness scales and smoking levels), and a composite variable was created. If respondents were unsure of one or more of these responses ("Don't know" "I do not know," etc.) they were assigned a value of 1, and a value of 0 otherwise. Using logistic regression, these post-hoc analyses determined that both males (OR 2.22; 95% CI 1.19-41.4) and females (OR 2.55; 95% CI 1.41-4.62) who were unsure of their sexual orientation were more likely to be unsure of responses to other survey questions as well.

Chapter 4: Discussion

4.1 Discussion of Descriptive Statistics

The primary aim of this study was to determine among drinkers in high school in Atlantic Canada, whether sexual orientation was associated with (a) experiencing any (one or more) alcohol-related harms (b) experiencing a higher count of alcohol related harms and (c) experiencing certain individual alcohol-related harms. In order to address a gap in the literature, this study also sought to investigate how adjusting for a range of covariates may impact these relationships. Finally, due to potential harm reduction policy implications, this study sought to explore how a wide range of variables impacted the outcome of experiencing any harm.

The results showed that high numbers of both male (41.7%) and female (46.0%) drinkers in this population experienced one or more alcohol-related harms in the past 12 months, confirming the importance of the present study. There was no significant difference between the proportion of males and females who experienced any harms; there were however, significant differences between males and females for the nature of the individual harms experienced, which along with findings from the literature justified undertaking a sex-stratified analysis (23,24).

The most prevalent harm among both males (19.0%) and females (22.7%) was unplanned sex under the influence of alcohol or drugs. This harm may be most prevalent as it is the only one of the nine to also include “under the influence of drugs” in the original ASDUS questionnaire. The second most prevalent harm among males was damaging property

while under the influence of alcohol (17.8%). This is in line with previous findings among university students that males tend to experience harms related to damage and violence (28). The second most prevalent harm among females was injuring oneself (20.2%). This is also in line with findings among university students that females tend to experience harms related to blacking out and sustaining injuries (23,28). Overall, seven of the nine harms of interest were associated with sex. Males were more likely than females to report having trouble with police, consuming alcohol before breakfast, damaging property and drinking and driving. Experiencing tensions or disagreements with family and/or friends, an impact on ability to buy other things and self-injury were disproportionately associated with being female. Alcohol affecting schoolwork and unplanned sex under the influence of alcohol or drugs had no statistically significant association with sex.

4.2 Discussion of Main Results

The literature around sexual orientation and alcohol-related harms in a high school population is sparse, with only one study conducted in a specific population. Homma *et al.* found that among British Colombian East and Southeast Asian students, the odds of experiencing one or more alcohol related problems in the past year was more than two times higher for mostly heterosexual females compared to heterosexual females (in unadjusted analyses) (24). Although the present study sample was smaller, was not restricted based on ethnicity, and examined slightly different problems, these analyses also found in unadjusted models that mostly heterosexual females were more likely than their heterosexual counterparts to experience one or more alcohol-related harm. Homma

et al. (24) suggest that this association may arise due to increased minority stress related to a sense of non-belonging in the traditional non-heterosexual orientation groups (i.e. LGB), and double minority status (sex and sexual orientation). 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 (37).

Duryea & Frantz (23) found that bisexual female university students had higher levels of harm than their heterosexual counterparts (with no adjustment for covariates); therefore it was hypothesized that bisexual females in high school may also be at an increased likelihood to experience any harm. The present study found a weak unadjusted association between bisexual orientation and increased odds of experiencing any harm, though this association disappeared in adjusted analysis. Such associations may be partially explained by the heightened minority stress experienced by bisexual females due to double minority status, and bi-negativity, previously reported in the literature. The unadjusted odds of experiencing one or more harms for 100% homosexual females and mostly homosexual females was not significantly different from that of heterosexual females. For 100% homosexual females, this is consistent with the small body of literature on the topic (23,24). There is presently no literature on mostly homosexual youth and alcohol-related harms.

Compared to heterosexual males, in the present study mostly heterosexual males were less likely to experience one or more alcohol-related harms in unadjusted associations. Homma *et al.* found no significant difference in the odds of experiencing one or more

problems between heterosexual and mostly heterosexual males, though this was in a very specific ethnic group (24). One of the hypotheses as to why heterosexual males may be more at risk for alcohol-related harms than non-heterosexual males is related to social norms around masculinity (116). A pressure to conform to masculine gender norms as a heterosexual male can impact several health behaviours related to alcohol, including misuse and physical fighting (117). Duryea & Frantz, in their study of university students, also found that heterosexual males were significantly more likely to report injuring others and fighting compared to gay students. On an overall index of harms, Duryea & Frantz found that both male heterosexual and bisexual students were at a higher risk than gay students, with no significant differences observed between heterosexual and bisexual students (23). That study did not assess categories of sexual orientation such mostly heterosexual, or mostly homosexual (23). In the present study no other significant differences in experiencing one or more alcohol-related harms by sexual orientation were observed.

This study also sought to examine whether there were sexual orientation differences in adolescents' experiences of more than one harm. Among males, there was no association seen between any non-heterosexual orientation and increasing number of alcohol-related harms before adjusting for other characteristics. This is contrary to the findings of Duryea & Frantz, though it must be noted that their study investigates a different population – college students in the United States (23).

In the present study, compared to female students identifying as heterosexual, identifying as a mostly heterosexual female was associated with experiencing an increased number of

alcohol-related harms in unadjusted analyses. When only taking into account sex and sexual orientation, mostly heterosexual females in Atlantic Canadian high schools are more likely to experience any alcohol-related harm, and an increased count of alcohol-related harms. Compared to heterosexual females, bisexual females were not more likely to experience a higher count of alcohol-related harms This was contrary to the findings of Duryea & Frantz (23), who reported that bisexual females experienced a higher mean count of alcohol-related harms than their heterosexual counterparts, although again it must be noted that although they studied American college students. The failure of this association to reach statistical significance in the current study could be explained partially by a lack of power. Furthermore, since Duryea & Frantz did not include mostly heterosexual orientation as an option in their study, females in this group most likely went on to identify as either bisexual or heterosexual, both of which groups were found to be at a higher risk for harm (23). It is possible that some of the heightened risk among heterosexuals and bisexuals in that study could be attributed to the fact that mostly heterosexual students were not analyzed separately. The present study, along with Homma *et al.* (24), has observed in unadjusted analyses that mostly heterosexual high school females were at a heightened risk for alcohol-related harms, though this relationship disappeared when adjusted for covariates (24). This option should be included in sexual orientation survey questions when substance use problems are also included.

In the present study, among males, sexual orientation was associated with two individual alcohol-related harms before adjusting for other factors. Mostly heterosexual males were less likely to drink and drive and engage in unplanned sex than their heterosexual

counterparts. The protective association of mostly heterosexual orientation with specific alcohol-related harms has not yet been reported in the literature. Duryea & Frantz examined drinking and driving, and drinking and unprotected sex (which was a slightly different outcome from this study, which included drinking and drug use), and found no significant differences between heterosexual, gay and bisexual college students, though they did not consider mostly heterosexual orientation (23). Significant differences by sexual orientation category related to unplanned sex may be explained by age and adolescent development. More college students than high school students engage in sexual activity, which may cancel out sexual orientation differences in this population (118).

In unadjusted models, mostly heterosexual females were significantly more likely to experience alcohol-related tensions or disagreements with family, and injure themselves as a result of alcohol use than their heterosexual counterparts. Duryea & Frantz (23) found that bisexual females were more likely to injure themselves than their heterosexual counterparts, but did not include mostly heterosexual orientation as an option. They did not investigate tensions and disagreements with family or friends (23). Also in unadjusted models, bisexual females were significantly more likely than their heterosexual counterparts to engage in unplanned sex under the influence of alcohol or drugs. This finding is similar to that of Duryea & Frantz, who found that bisexual college students were more likely to engage in unprotected sex than their heterosexual counterparts (23). Consistent with previous literature, the present analysis found that in crude associations, females who experience both same sex and opposite attractions are at a higher risk for harm. However, sexual orientation alone is not sufficient to explain alcohol-related

problems in youth; until now, no study has examined the association between harm and sexual orientation after adjusting for a range of covariates. This study sought to fill this gap in the literature by investigating the role of a range of potential covariates, as identified through a literature search.

After adjusting for the following covariates – sensation seeking, grade, cannabis use, and self-rated health - mostly heterosexual males were still less likely to experience any harm than their heterosexual counterparts. In unadjusted models, there was no association between non-heterosexual orientation and count of harms. However, after adjusting for covariates, mostly heterosexual males and mostly homosexual males were less likely to experience an increased count of harms. In adjusted models for individual harms, mostly heterosexual respondents were less likely to drink and drive, and engage in unplanned sex under the influence of alcohol or drugs. These protective associations were also observed in unadjusted models, but were even stronger after adjusting for covariates for drinking and driving.

The slightly protective association among male students with mostly homosexual orientation and count of harms may arise due to the small number of students who identify as having this sexual orientation (n=19; 0.75%). For example, there are no mostly homosexual students who indicate damaging property, which may be attributed to the fact that there were simply not enough mostly homosexual respondents in the study. Studies with small sample sizes tend to overestimate effect sizes when using logistic regression (119). There is very little literature on the subgroup of non-heterosexual students who identify as mostly homosexual. Further studies should be conducted with larger sample

sizes to determine whether this association is spurious, attributable to small sample size, or if mostly homosexual male high school students are actually less likely to experience harm based on their sexual orientation, even after adjusting for a range of covariates. As for mostly heterosexual students, protective associations with drinking and driving and engaging in unplanned sex under the influence of alcohol and drugs contribute to the overall protective association with any harm. As with unadjusted associations, these associations may arise due to masculine norms around drinking (5,116,117).

The most parsimonious model for the association between any alcohol-related harm and sexual orientation in females included school connectedness, depression, sensation seeking, grade and cannabis use. After accounting for these covariates, mostly heterosexual and bisexual females were no longer more likely to experience any harm. Both 100% homosexual and unsure females were less likely to experience any harm after adjusting for the aforementioned covariates. Although mostly heterosexual and bisexual orientation were associated with experiencing one or more alcohol-related harms, this association disappeared when taking into account other factors such as levels of depression. It appears that when holding other factors constant, 100% homosexual orientation is associated with a decreased risk of overall harm. Further studies should be conducted in a larger sample to confirm or refute this association.

All heightened crude associations among females between non-heterosexual orientations and individual harms disappeared after adjusting for covariates and two new associations emerged: females who were unsure of their sexual orientation were less likely to damage property (OR 0.27; 95% CI 0.07-0.94), and bisexual females were less likely to be unable

to spend money on other things due to alcohol spending (OR 0.43; 95% CI 0.22-0.83). The association between bisexual orientation and spending on alcohol could be due to a number of variables not measured in the ASDUS, including money management and employment status. Another explanation could be that the association is spurious in nature. When undertaking multiple comparisons, there is always the risk of identifying spurious associations, or committing type I errors.. Adopting a "frequentist" approach, in a large series of statistical tests at the α=0.05 level, 5% will have p values less than 0.05 purely by chance (i.e. significant associations will be identified where there really are none).

The association between mostly heterosexual orientation and an increased count of harms in females that was observed in unadjusted models disappeared after accounting for all significant covariates. Females who indicated that they were unsure about their sexual orientation were still less likely to experience an increased count of harms after adjusting for covariates. The protective associations between unsure sexual orientation and alcohol-related harms may be explained by variables that are not included in models. Saewyc *et al.* posit that one may be more likely to indicate they are unsure of their sexual orientation if their primary language is not English, if they have a learning disability or if they are unsure of their answers to other questions (51). In this study sample, those who were unsure of their sexual orientation were more likely to speak a language other than English and/or French at home. This could have created difficulty in answering and understanding survey questions. Respondents may have chosen "not sure" due to not understanding the question, instead of genuinely questioning their sexual orientation as the question aims to capture. Post-hoc analyses also revealed the potential of response set bias, as those who

were unsure of their sexual orientation were also more likely to be unsure of other responses to survey questions. It is thus plausible that the adjusted association between unsure sexual orientation and experiencing any and increased harms in females is related to these factors.

It is important to consider both unadjusted and adjusted associations between sexual orientation and harm when developing harm reduction strategies. Although many positive associations disappear after adjustment, this may be explained by the fact that some of the covariates that were adjusted for have the potential to act as mediators of this relationship. For example, depression, a covariate adjusted for in female models, may be caused by experiences of minority stress in those of non-heterosexual orientation. This association may be observed in females rather than males due to the increased role that minority stress can play in the lives of non-heterosexual females (61). Depressive symptoms also lead to increased harm when drinking, as explained in both the self-medication and impaired functioning models (120). Therefore adjusting for depression could act to decrease the odds ratio for experiencing any harm among females in adjusted models. Although adjusted models provide a more robust picture of the relationship between alcohol-related harms and sexual orientation, it is important to not downplay the significance of including sexual orientation in harm reduction work. The present study findings simply suggest that sexual orientation is one of many important factors to consider when planning alcohol-related harm reduction programs.

After characterizing the relationship between sexual orientation and alcohol-related harms, a more broad exploratory analysis was undertaken. This analysis aimed to identify

overall which covariates were associated with experiencing one or more alcohol-relate harms. Stakeholders have the potential to better inform future harm reduction strategies by identifying overall risk and protective factors for alcohol-related harms in the study sample.

An initial literature review indicated that several psychosocial indicators might be associated with experiencing alcohol-related harms. Contrary to the study hypothesis, in adjusted models for both males and females, school connectedness was not significantly associated with the odds of experiencing one or more alcohol-related harms. Although high school connectedness has previously been shown to be protective against a wide range of health risk behaviours in both males and females, it appears to not have an effect in the present study sample. It is possible that the protective benefits of social support against harm are captured with the parental connectedness measure in this sample. Parental connectedness was strongly protective against experiencing alcohol-related harm in both males and females. This could be explained by the fact that among Canadians, close family ties are most prevalent in the Atlantic region (121). Having strong social supports in the home environment can help adolescents stay on the right path, rather than engaging in risk behaviours (85). Screening positive for an anxiety disorder was not associated with experiencing any alcohol-related harm among females at the $p<0.05$ level, and was not included as a covariate in male models. The review of the literature indicated that high levels of social anxiety were associated with increased alcohol-related harms (74). However, the measure used in the present analyses is more general, capturing five factors of anxiety: panic/somatic, generalized anxiety, separation anxiety, social phobia and school phobia. Furthermore, the recommended cut-off of 6 for the 5-item SCARED

scale has 74% sensitivity and 73% specificity. This means that the test correctly classifies 74% of those with an anxiety disorder, and 73% of those who do not have an anxiety disorder (114). This may impact the expected association between anxiety and increased harm. As expected, high sensation seeking tendencies, a trait associated with increased risk-taking behaviours, was associated with experiencing one or more harms in both males and females. In females, compared to minimal depressive symptoms, somewhat elevated and very elevated depressive symptoms were associated with any harm. These associations are consistent with the self-medication hypothesis, whereby using alcohol to alleviate depressive symptoms places individuals at a higher risk for hazardous consumption and consequences (73). Depression and coping-mechanisms have previously been shown to have stronger associations with alcohol consumption and harms in females than males in the past (75). This was also observed in the present study sample, where levels of depression did not impact the odds of experiencing harm in adjusted models.

Several demographic covariates were also included in exploratory models. Increasing grade was associated with increased odds of experiencing any alcohol-related harm in adjusted models for both males and females. This is expected, as increasing age is also associated with alcohol consumption and binge drinking (9). The heightened association with school grade level and alcohol-related harm is particularly relevant to harm reduction strategies, and could be interpreted as indicating that older students are more important to target. Conversely, targeting students earlier may lead to a decreased burden of harm in later years. Rating one's health as good or above, compared to fair or poor, was protective of alcohol-related harms in both males and females. This acts as a proxy measure of a burden of disease, and high self-rated health has been shown to be

associated with a lower likelihood of engaging in a range of health risk behaviours, including binge drinking (122). The effect of several demographic covariates differed by sex. Mostly heterosexual orientation and increasing socioeconomic status were protective of alcohol-related harms in adjusted models for males, whereas they had no significant effect in females. A 100% homosexual orientation was protective of experiencing any harm in females, but not in males. These associations with sexual orientation are already addressed within the discussion section.

Finally, any past-year cannabis use exhibited the strongest association with experiencing alcohol-related harm in both males and females. Multiple substance use can increase impairment, leading to a loss of control, and a higher risk of harm (36).

It must be noted that exploratory analyses determined that many factors in the lives of adolescents have a much larger impact on experiencing alcohol-related harms than sexual orientation. Factors that can be addressed or altered through policies and programming are particularly relevant. For example, the knowledge that increasing grade is associated with increased odds of harm can be used to determine at which age programs should be delivered. The protective association of parental connectedness against alcohol-related harms may warrant intervention strategies and programs to improve feelings of connectedness between parents and their adolescent children. The heightened odds of experiencing any harm with depressive symptoms in females may warrant more mental health support services in schools. The very strong association between cannabis use and alcohol-related harm may warrant strategies to encourage safer use of this substance (i.e. suggesting that students do not use multiple substances at once). These are simply

suggestions; however, the results of this study have the potential to guide future harm reduction policies and programming in the young population.

4.3 Discussion of Supplementary Analyses

Supplementary analyses sought to examine whether alcohol use patterns may partially explain the relationship between alcohol-related harms and sexual orientation. Results indicated that mostly heterosexual females were more likely than their heterosexual counterparts to consume any alcohol over the past 12 months. This may be due to minority stress and coping mechanisms (31). An increased likelihood of consuming alcohol may lead to an increased likelihood of incurring harm due to consumption. Females and males who were unsure about their sexual orientation were both less likely to consume any alcohol over the past 12 months. The protective association between unsure sexual orientation and alcohol use may also be explained by the previously discussed hypotheses outlined by Saewyc *et al* (51).

Binge drinking, which may be associated with increased harm due to increased intoxication, was also assessed in the overall population of high school respondents. As with any alcohol consumption, males and females who were unsure of their sexual orientation were less likely to binge drink. The most interesting associations arose in mostly heterosexual males, who were less likely to experience any harm in crude and adjusted associations, and mostly heterosexual females who were more likely to experience any harm in crude associations. Mostly heterosexual males were significantly less likely to binge drink than their heterosexual counterparts, and mostly heterosexual

females were significantly more likely to binge drink than their heterosexual counterparts. It is possible that binge drinking may act as a mediator of the relationship between sexual orientation and burden of harm. Binge drinking is another important factor to consider in harm reduction strategies.

4.4 Study Strengths and Limitations

The present study sought to fill a gap in the literature relevant to the health and well being of a population particularly susceptible to harms, adolescents, while focusing on a potentially vulnerable subpopulation: those of non-heterosexual orientation. The ASDUS sampling strategy aimed to provide a representative sample of three Atlantic provinces, and the survey had a high overall response rate (>90%) and overall sample size (n=9226). 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 (47). Furthermore, this study examined differences between multiple surveyed categories of sexual orientation, rather than amalgamating all those of non-heterosexual orientation. Grouping all non-heterosexual orientations together for analysis was a clear weakness in the current literature, as differences exist between the negative consequences of alcohol consumption of both males and females, and their respective subcategories of sexual orientation (23). Many forms of harm were examined: experiencing one or more harm, experiencing an increased number of harms, and experiencing specific harms, the latter two which had not yet been examined in a high school population in relation to sexual orientation. Understanding the burden of not only overall harm, but specific harms, by sex and sexual orientation are important steps to take when developing harm reduction interventions. Furthermore, unlike other studies in the

literature, models were adjusted for a series of covariates that could affect the relationship between alcohol-related harms and sexual orientation (23,24).

Though the overall response rate was over 90%, certain regions had significantly lower responses. One such region of concern is in the Halifax Regional School Board (HRSB), due to heightened consent procedures. Active, signed parental/guardian consent was mandatory for all HRSB students, resulting in a 59% response rate (50.5% of students enrolled). Though this is still a perfectly acceptable rate of response, it is possible that students whose parents did not provide active consent differed significantly from those whose parents did, most likely being higher risk students with less social supports in the home. This limitation could lead to an underestimation of the effect sizes for alcohol-related harms across all sexual orientations. Survey weights were used to adjust for non-response bias. By random chance, no schools from coastal communities in Labrador were included, though there is no current research to suggest these students would differ significantly from others in NFLD. This study also 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 low 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. Low frequencies of 100% homosexual males and females were also observed. This may have led to inflated protective associations, but the lack of power may also have hindered us from discovering true heightened associations

between harm and certain non-heterosexual orientation categories. As previously stated, conducting this study with a larger sample size may have resulted in different associations being detected. The ASDUS did not contain a direct measure of minority stress, and this study was therefore unable to determine whether non-heterosexual adolescents in Atlantic Canada experienced heightened minority stress. Future studies should explore this concept, to determine how experiences with minority stress impact experiences with alcohol-related harms. Another limitation to this study is that although multiple comparisons were conducted, a Bonferroni adjusted p-value cut-off for significance was not employed. This could have led to identifying spurious associations, and a Bonferroni adjustment would be recommended for a study with a larger sample size.

Due to the self-report nature of this survey, social desirability bias and recall bias could come into play. Those of non-heterosexual orientation may be less likely to report their sexual orientation due to stigmatization, even considering the anonymous nature of the survey. This could decrease the number of students of non-heterosexual orientation in the analysis, subsequently decreasing power to detect differences between groups, as well as misclassification. Depending on the nature of social desirability bias, students may be more likely or less likely to report alcohol-related harms based on their sex and sexual orientation.

Though Rehm *et al.* report relatively stable individual drinking patterns among adolescents, the data from this study are cross-sectional and, therefore, cannot be generalized beyond the point in time they were gathered (123). Finally, causal associations cannot be ascertained when analyzing cross-sectional data.

Chapter 5: Conclusions and Future Directions

This is the first study to examine a range of harmful outcomes associated with alcohol use by sex and sexual orientation in a diverse high school population. Damaging property, drinking and driving, consuming alcohol before breakfast and experiencing trouble with the police were disproportionately associated with being male; and experiencing tensions or disagreements with family and/or friends, money management problems and self-injury were disproportionately associated with being female. This is important information in planning resource allocation for harm reduction strategies, suggesting that these strategies should be sex-specific.

After adjusting for a range of covariates, the heightened associations between alcohol-related harms in mostly heterosexual and bisexual females disappeared. This does not downplay the importance of considering sexual orientation in harm reduction interventions; however, it highlights the importance of considering other factors. Through an exploratory analysis cannabis use, depression, parental connectedness and grade were as being particularly important to consider among females.

Compared to mostly heterosexual males, heterosexual males were more likely to experience any harm, and specific harms of drinking and driving, and engaging in unplanned sex under the influence of alcohol and/or drugs. These associations persisted after adjusting for a range of covariates. This suggests that among male adolescents in Atlantic Canada, heterosexual orientation puts individuals at a higher risk of experiencing

harm than non-heterosexual orientation. This study also identified a number of other modifiable factors that may be more important to target in males, including encouraging safe or reduced cannabis use, increasing parental connectedness, and decreasing sensation seeking (which is strongly related to masculine norms around risk-taking).

Further studies should be undertaken, preferably with a larger sample size, in order to confirm or refute these associations. Provincial Departments of Education will be sent copies of the study's findings in order to begin to inform their future policies, but will also be cautioned of the cross-sectional nature of the data, as well as the study's limitations and the need for more evidence.

Stakeholders should continue to take steps towards developing informed alcohol-related harm reduction strategies, in order to improve the overall health and well being of the young population, where alcohol use is already ingrained in social norms. Harm reduction strategies have the potential to decrease negative physical consequences for young drinkers, negative social consequences for their friends and families, and costs to the Canadian economy.

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Appendix A: Tables and Figures of Results

Table 2a. Summary of main exposure variable and covariates among the study sample by sex, unweighted frequencies and weighted percentages with 95% CI in parentheses (n=4996).

Variable	Males (n=2359)		Females (n=2637)	
	Unweighted frequency	Weighted percentage (95%CI)	Unweighted frequency	Weighted percentage (95%CI)
Sexual Orientation				
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)
Grade				
9	665	27.8 (24.5-31.3)	690	25.7 (22.6-29.0)
10	856	34.6 (30.7-38.7)	908	32.4 (28.7-36.3)
12	838	37.6 (33.5-42.0)	1039	42.0 (37.4-46.7)
Academic Achievement				
≥80% average	844	36.7 (33.5-39.9)	1389	53.4 (49.8-56.8)
<80% average	1341	55.2 (51.8-58.4)	1114	41.6 (38.3-45.0)
Unknown or Missing	174	8.1 (6.5-10.2)	134	5.0 (4.1-6.1)
Socioeconomic Status				
Low	134	5.1 (3.97-6.49)	165	5.7 (4.7-6.9)
Middle	1327	58.9 (56.3-61.6)	1397	53.6 (50.6-56.4)
High	769	30.8 (28.3-33.3)	977	37.0 (34.2-40.0)
Missing	129	5.2 (4.1-6.5)	98	3.7 (2.7-5.1)
Religiosity				
Low	1683	71.8 (68.9-74.5)	1666	62.9 (60.4-65.4)
High	657	27.5 (24.8-30.4)	954	36.5 (34.0-39.1)
Missing	19	0.7 (0.5-1.2)	17	0.5 (0.3-0.9)
Cannabis Use				
No	1238	49.4 (46.4-52.4)	1478	50.6 (47.4-53.9)
Yes	1102	49.7 (46.8-52.5)	1142	48.7 (45.5-51.9)
Missing	19	0.9 (0.5-1.9)	17	0.7 (0.4-1.2)
Self-Rated Health				
Fair or Poor	135	5.6 (4.4-6.9)	180	7.0 (5.7-8.6)
Good or Above	2115	90.2 (88.3-91.9)	2356	89.0 (86.9-90.8)
Missing	109	4.2 (3.1-5.7)	101	4.0 (3.0-5.3)
Sensation Seeking				
Low	1709	73.9 (71.6-76.1)	2091	79.0 (76.8-81.1)
High	574	23.5 (21.4-25.7)	505	18.9 (16.8-21.1)
Indeterminate	76	2.6 (2.0-3.6)	41	2.1 (1.3-3.2)
Depression				
Minimal	1542	65.8 (62.5-68.9)	1272	45.2 (42.5-47.9)
Somewhat Elevated	461	20.1 (17.8-22.6)	801	32.7 (29.9-35.7)
Very Elevated	107	4.4 (3.4-5.8)	350	13.8 (11.9-16.0)
Indeterminate	249	9.7 (8.2-11.4)	214	8.3 (6.8-10.0)

Anxiety Disorder				
None	1961	82.7 (80.3-84.8)	1585	59.1 (56.4-61.7)
Possible Presence	301	13.7 (11.7-15.8)	997	38.6 (35.9-41.3)
Indeterminate	97	3.7 (2.8-4.8)	55	2.4 (1.7-3.3)
Parental Connectedness				
Lower	2019	86.4 (84.4-88.2)	2135	82.1 (80.0-84.0)
Higher	314	12.4 (10.7-14.4)	492	17.5 (15.6-19.5)
Indeterminate	26	1.2 (0.7-2.0)	10	0.4 (0.2-0.9)
School Connectedness				
Lower	2019	86.6 (84.6-88.4)	2339	89.4 (87.1-91.3)
Higher	302	12.0 (10.3-14.0)	278	9.3 (7.7-11.3)
Indeterminate	38	1.4 (0.9-2.0)	20	1.3 (0.5-3.1)

Table 2b. Summary of covariates among males in the study sample by sexual orientation, unweighted frequencies.x

Covariate	Unweighted frequency by sexual orientation						
	Hetero-sexual	Mostly Hetero-sexual	Bi-sexual	Mostly Homo-sexual	100% Homo-sexual	Unsure	P-value (chi2)
Grade							0.036*
9	585	25	12	--+	5	34	
10	774	21	20	--+	10	26	
12	733	36	26	--+	12	21	
Academic Achievement							0.001*
≥80%	761	39	12	6	11	15	
<80%	1181	41	41	12	13	53	
Socioeconomic Status							<0.001**
Low	115	5	5	--+	--+	5	
Middle	1183	52	35	--+	--+	30	
High	688	22	17	--+	--+	28	
Religiosity							0.067
Low	1476	69	46	--+	--+	53	
High	599	13	12	--+	--+	26	
Cannabis Use							0.943
No	1089	47	31	10	14	47	
Yes	984	35	27	9	13	34	
Self-Rated Health							0.001*
Fair or Poor	105	5	10	--+	--+	8	
Good or Above	1892	73	44	--+	--+	68	
Sensation Seeking							0.001*
Low	1529	53	34	--+	15	62	
High	497	28	22	--+	12	12	
Depression							<0.001**
Minimal	1420	31	26	6	--+	--+	
Somewhat Elevated	375	35	15	6	--+	--+	
Very Elevated	76	8	13	5	--+	--+	
Anxiety Disorder							<0.001**
None	1791	50	36	9	16	59	
Possible Presence	217	29	20	9	11	15	
Parental Connectedness							0.936
Lower	1784	73	49	--+	--+	72	
Higher	284	9	8	--+	--+	8	
School Connectedness							0.495
Lower	1782	74	--+	--+	--+	68	
Higher	275	8	--+	--+	--+	12	

[X]Please note: Any variable level (by sexual orientation) with a cell count smaller than 5 resulted in all observations for that variable being suppressed due to the risk of identifying respondents. Missing and indeterminate values have been excluded from this table due to small cell counts in some sexual orientation categories. Missing and indeterminate values have been described by sex and covariate in Table 2a.

[+]These data have been omitted from the table due to one or more small cell counts (<5).

*p<0.05

**p<0.001

Table 2c. Summary of covariates among females in the study sample by sexual orientation, unweighted frequencies.x

Covariate	Unweighted frequency by sexual orientation						
	Hetero-sexual	Mostly Hetero-sexual	Bi-sexual	Mostly Homo-sexual	100% Homo-sexual	Unsure	P-value (chi2)
Grade							0.470
9	558	53	47	--+	6	23	
10	728	83	61	--+	7	23	
12	824	114	62	--+	9	21	
Academic Achievement							<0.001**
≥80%	1161	147	51	6	7	17	
<80%	856	91	108	10	14	35	
Socioeconomic Status							<0.001**
Low	108	27	21	--+	---	7	
Middle	1101	143	99	--+	---	31	
High	827	73	43	--+	---	19	
Religiosity							0.003*
Low	1293	181	122	12	17	41	
High	804	65	48	6	5	26	
Cannabis Use							<0.001**
No	1237	118	62	9	9	43	
Yes	858	132	108	9	12	23	
Self-Rated Health							<0.001**
Fair or Poor	107	22	40	--+	---	8	
Good or Above	1925	217	122	--+	---	56	
Sensation Seeking							<0.001**
Low	1711	186	116	12	15	51	
High	371	59	51	6	7	11	
Depression							<0.001**
Minimal	1108	88	39	--+	6	26	
Somewhat Elevated	604	96	68	--+	5	22	
Very Elevated	224	56	53	--+	6	7	
Anxiety Disorder							<0.001**
None							
Possible	1324	115	82	7	15	42	
Presence	744	129	86	11	7	20	
Parental Connectedness							<0.001**
Lower	1678	220	151	--+	---	52	
Higher	426	29	18	--+	---	13	
School Connectedness							0.002*
Lower	1846	236	158	--+	---	--+	
Higher	247	14	12	--+	---	--+	

[X]Please note: Any variable level (by sexual orientation) with a cell count smaller than 5 resulted in all observations for that variable being suppressed due to the risk of identifying respondents. Missing and indeterminate values have been excluded from this table due to small cell counts in some sexual orientation categories. Missing and indeterminate values have been described by sex and covariate in Table 2a.

[+]These data have been omitted from the table due to one or more small cell counts (<5).

*p<0.05

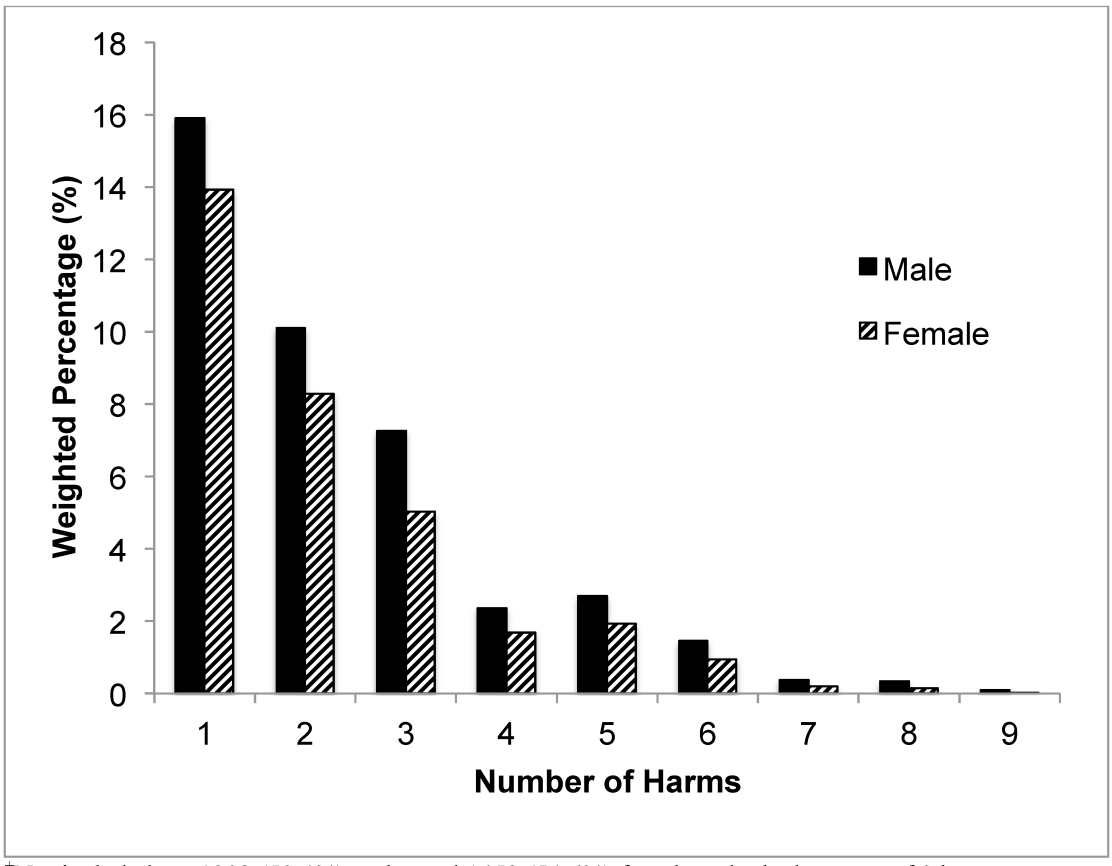
**p<0.001

Table 3. Past 12-month experience with alcohol-related harms in the study sample 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)	p-value (chi2)
Affected schoolwork or exams	72	2.9 (2.2-3.8)	74	2.6 (1.9-3.5)	0.601
Tensions or disagreements with family and/or friends	187	7.6 (6.2-9.4)	307	11.6 (10.0-13.4)[+]	<0.001**
Trouble with police	108	4.7 (3.7-6.1)	63	2.6 (1.9-3.6)	<0.001**
Affected ability to buy other things	210	8.9 (7.2-11.0)	337	14.2 (12.3-16.4)[+]	<0.001**
Consumed alcohol before breakfast	233	8.5 (7.1-10.1)	194	7.0 (5.8-8.5)	0.001*
Damaged property	406	17.8 (15.8-20.0)[+]	344	14.6 (12.4-17.0)[+]	<0.001**
Injured oneself	355	16.3 (13.8-19.1)[+]	475	20.2 (17.7-22.9)[+]	0.005*
Drove a motor vehicle under the influence	296	10.1 (8.4-12.0)[+]	146	5.1 (4.0-6.4)	<0.001**
Unplanned sex	435	19.0 (16.9-21.3)[*]	544	22.7 (20.3-25.3)[+]	0.069
One or more harms	986	41.7 (38.5-45.0)	1135	46.0 (43.2-48.9)	0.592

[+]Point estimate of proportion is above 10%, was analyzed individually for association with sexual orientation.
*Harm is associated with sex, $p<0.05$.
**Harm is associated with sex $p<0.001$.

Figure 4. Distribution of the number of harms experienced by those in the study sample (≥1 harm)[+], by sex, weighted percentages.



[+]Not included are 1302 (59.4%) males and 1453 (54.6%) females who had a count of 0 harms.

Table 4a. Weighted percentage, and unadjusted and adjusted odds ratio for experiencing any alcohol-related harms (with 95% CI) among male high school drinkers, by sexual orientation.

Sexual Orientation	Weighted Percentage (%)	OR	
		Unadjusted (95% CI)	Adjusted (95% CI)
Heterosexual	41.7	1.00 (--)	1.00 (--)
Mostly Heterosexual	28.1	0.54 (0.30-0.98)*	0.46 (0.26-0.80)*
Bisexual	53.4	1.61 (0.68-3.80)	1.11 (0.55-2.21)
Mostly Homosexual	57.4	1.88 (0.57-6.18)	1.21 (0.45-3.26)
100% Homosexual	41.0	0.97 (0.29-3.25)	0.72 (0.11-4.97)
Unsure	40.4	0.94 (0.53-1.69)	1.33 (0.71-2.51)

*p<0.05
**p<0.001

Table 4b. Weighted percentage, and unadjusted and adjusted odds ratio for experiencing any alcohol-related harms (with 95% CI) among female high school drinkers, by sexual orientation.

Sexual Orientation	Weighted Percentage (%)	OR	
		Unadjusted (95% CI)	Adjusted (95% CI)
Heterosexual	45.1	1.00 (--)	1.00 (--)
Mostly Heterosexual	53.3	1.39 (1.04-1.86)*	1.06 (0.71-1.58)
Bisexual	55.6	1.52 (1.001-2.32)*	0.80 (0.52-1.24)
Mostly Homosexual	42.3	0.89 (0.30-2.64)	0.58 (0.19-1.79)
100% Homosexual	17.8	0.26 (0.06-1.18)	0.09 (0.02-0.41)**
Unsure	30.1	0.52 (0.27-1.03)	0.47 (0.22-0.99)*

*p<0.05
**p<0.001

Table 5. Unadjusted odds ratios for experiencing any alcohol-related harm (with 95% CI) among high school drinkers, by sex and all covariates of interest.

Variable	Males	Females
	Unadjusted OR (95% CI)	**Unadjusted OR (95% CI)**
Grade		
9	1.00	1.00
10	1.52 (1.11-2.09)*	1.54 (1.17-2.02)*
12	2.95 (2.14-4.08)**	1.84 (1.39-2.44)**
Academic Achievement		
≥80% average	1.00	1.00
<80% average	1.93 (1.56-2.38)**	1.62 (1.29-2.05)**
Socioeconomic Status		
Low	1.00	1.00
Middle	0.57 (0.33-0.99)*	0.65 (0.43-0.98)*
High	0.36 (0.18-0.71)*	0.50 (0.33-0.76)*
Religiosity		
Low	1.00	1.00
High	0.75 (0.58-0.97)*	0.87 (0.69-1.09)
Cannabis Use		
No	1.00	1.00
Yes	6.01 (4.67-7.70)**	7.32 (5.77-9.29)**
Self-Rated Health		
Fair or Poor	1.00	1.00
Good or Above	0.48 (0.30-0.76)*	0.25 (0.17-0.36)**
Sensation Seeking		
Low	1.00	1.00
High	2.88 (2.17-3.83)**	2.37 (1.72-3.27)**
Depression		
Minimal	1.00	1.00
Somewhat Elevated	1.35 (1.03-1.76)*	2.35 (1.81-3.05)**
Very Elevated	1.38 (0.78-2.43)	2.53 (1.69-3.79)**
Anxiety Disorder		
None	1.00	1.00
Possible Presence	0.95 (0.71-1.26)	1.46 (1.17-1.81)*
Parental Connectedness		
Lower	1.00	1.00
Higher	0.37 (0.23-0.58)**	0.36 (0.27-0.48)**
School Connectedness		
Lower	1.00	1.00
Higher	1.24 (0.88-1.73)	0.65 (0.45-0.94)**
Sexual Orientation		
Heterosexual	1.00 (--)	1.00 (--)
Mostly Heterosexual	0.54 (0.30-0.98)*	1.39 (1.04-1.86)*
Bisexual	1.61 (0.68-3.80)	1.52 (1.001-2.32)*
Mostly Homosexual	1.88 (0.57-6.18)	0.89 (0.30-2.64)
100% Homosexual	0.97 (0.29-3.25)	0.26 (0.06-1.18)
Unsure	0.94 (0.53-1.69)	0.52 (0.27-1.03)

*p<0.05
**p<0.001

Table 6. Unadjusted and adjusted incidence rate ratios (IRRs) for increasing count of alcohol-related harms (95% CI) among high school drinkers, by sex and sexual orientation.

Sexual Orientation	Males		Females	
	Unadjusted IRR (95% CI)	**Adjusted IRR (95% CI)**	**Unadjusted IRR (95% CI)**	**Adjusted IRR (95% CI)**
Heterosexual	1.00 (--)	1.00 (--)	1.00 (--)	1.00 (--)
Mostly Heterosexual	0.71 (0.42-1.20)	0.61 (0.40-0.91)*	1.28 (1.02-1.61)*	1.05 (0.85-1.29)
Bisexual	1.36 (0.77-2.38)	1.05 (0.71-1.57)	1.33 (0.98-1.81)	0.86 (0.66-1.12)
Mostly Homosexual	1.03 (0.55-1.90)	0.66 (0.44-0.998)*	1.06 (0.44-2.53)	0.70 (0.37-1.34)
100% Homosexual	0.61 (0.26-1.41)	0.62 (0.19-2.02)	0.46 (0.10-2.17)	0.27 (0.07-1.04)
Unsure	0.80 (0.49-1.29)	1.01 (0.66-1.53)	0.46 (0.26-0.80)*	0.50 (0.33-0.78)*

*p<0.05.
**p<0.001.

Table 7a. Weighted percentage, and unadjusted and adjusted odds ratios for experiencing individual alcohol-related harms (with 95% CI) among male high school drinkers, by sexual orientation.

Alcohol-Related Harm	Sexual Orientation					
	Heterosexual	Mostly Heterosexual	Bisexual	Mostly Homosexual	100% Homosexual	Unsure
Damage to property						
Unweighted percentage (%)	17.8	11.3	34.2	0.0	10.4	16.4
Unadjusted OR (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)
Adjusted OR (95% CI)	1.00 (--)	0.57 (0.25-1.29)	1.84 (0.64-5.31)	--	0.45 (0.06-3.22)	1.19 (0.54-2.63)
Self-injury						
Unweighted percentage (%)	16.0	12.9	31.4	9.0	9.5	16.5
Unadjusted OR (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)
Adjusted OR (95% CI)	1.00 (--)	0.73 (0.37-1.44)	1.70 (0.58-4.96)	0.47 (0.10-2.21)	0.36 (0.04-3.11)	1.39 (0.62-3.11)
DUI						
Unweighted percentage (%)	10.3	2.7	7.7	29.3	9.1	8.7
Unadjusted OR (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)
Adjusted OR (95% CI)	1.00 (--)	0.20 (0.07-0.62)*	0.45 (0.12-1.62)	2.18 (0.68-7.01)	0.75 (0.14-4.07)	0.99 (0.41-2.36)
Unplanned sex						
Unweighted percentage (%)	19.5	6.2	28.1	16.1	29.0	7.5
Unadjusted OR (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)
Adjusted OR (95% CI)	1.00 (--)	0.21 (0.08-0.55)*	1.00 (0.27-3.67)	0.38 (0.06-2.34)	1.48 (0.26-8.46)	0.42 (0.11-1.66)

*p<0.05

**p<0.001

Table 7b. Weighted percentage, and unadjusted and adjusted odds ratios for experiencing individual alcohol-related harms (with 95% CI) among female high school drinkers, by sexual orientation.

Alcohol-Related Harm	Sexual Orientation					
	Heterosexual	Mostly Heterosexual	Bisexual	Mostly Homosexual	100% Homosexual	Unsure
Tensions or disagreements						
Unweighted percentage (%)		18.5	15.6	10.7		8.0
Unadjusted OR (95% CI)	10.6	1.91 (1.22-3.01)**	1.66 (0.90-2.68)	1.01 (0.13-7.81)	4.1	0.73 (0.17-3.05)
Adjusted OR (95% CI)	1.00 (--)	1.51 (0.93-2.44)	0.91 (0.51-1.60)	0.57 (0.07-4.97)	0.36 (0.04-3.27)	0.66 (0.19-2.30)
Money lost	1.00 (--)				0.34 (0.03-3.88)	
Unweighted percentage (%)		16.9	11.8	19.7		
Unadjusted OR (95% CI)	14.3	1.21 (0.72-2.05)	0.80 (0.42-1.50)	1.47 (0.37-5.77)	6.2	8.4
Adjusted OR (95% CI)	1.00 (--)	0.94 (0.56-1.59)	0.43 (0.22-0.83)*	1.07 (0.26-4.41)	0.39 (0.04-3.89)	0.55 (0.22-1.37)
Damage to property	1.00 (--)				0.17 (0.01-3.15)	0.64 (0.23-1.80)
Unweighted percentage (%)		14.1	22.2	15.6		
Unadjusted OR (95% CI)	14.3	0.98 (0.59-1.62)	1.70 (0.99-2.92)	1.10 (0.23-5.22)	6.9	4.9
Adjusted OR (95% CI)	1.00 (--)	0.75 (0.45-1.26)	1.02 (0.59-1.76)	0.69 (0.13-1.38)	0.44 (0.10-1.93)	0.31 (0.09-1.05)
Self-injury	1.00 (--)				0.13 (0.01-1.38)	0.27 (0.07-0.94)*
Unweighted percentage (%)		26.4	24.6	20.2		
Unadjusted OR (95% CI)	19.3	1.50 (1.00-2.25)*	1.36 (0.81-2.27)	1.06 (0.27-4.10)	15.9	10.7
Adjusted OR (95% CI)	1.00 (--)	1.14 (0.72-1.81)	0.76 (0.46-1.27)	0.63 (0.14-2.95)	0.79 (0.16-3.80)	0.50 (0.15-1.66)
Unplanned sex	1.00 (--)				0.65 (0.17-2.55)	0.53 (0.18-1.57)
Unweighted percentage (%)		24.3	31.6	16.5		
Unadjusted OR (95% CI)	22.1	1.13 (0.72-1.75)	1.62 (1.04-2.53)*	0.69 (0.16-2.97)	13.6	12.8
Adjusted OR (95% CI)	1.00 (--)	0.89 (0.55-1.44)	1.11 (0.70-1.77)	0.49 (0.10-2.38)	0.55 (0.11-2.80)	0.52 (0.22-1.23)

*p<0.05

**p<0.00

Table 8. Adjusted odds ratios for experiencing any alcohol-related harm (with 95% CI) among high school drinkers, by sex and all covariates of interest.

Variable	Males	Females
	Adjusted OR (95% CI)	**Adjusted OR (95% CI)**
Grade		
9	1.00 (--)	1.00 (--)
10	1.42 (1.00-2.03)*	1.50 (1.10-2.05)*
12	3.12 (2.17-4.48)**	1.76 (1.31-2.39)**
Academic Achievement		
≥80% average	1.00 (--)	1.00 (--)
<80% average	1.21 (0.93-1.58)	1.07 (0.81-1.40)
Socioeconomic Status		
Low	1.00 (--)	1.00 (--)
Middle	0.49 (0.27-0.90)*	1.10 (0.71-1.72)
High	0.51 (0.27-0.97)*	1.01 (0.64-1.60)
Religiosity		
Low	1.00 (--)	---
High	0.82 (0.61-1.10)	---
Cannabis Use		
No	1.00 (--)	1.00 (--)
Yes	5.15 (3.92-6.78)**	6.12 (4.78-7.83)**
Self-Rated Health		
Fair or Poor	1.00 (--)	1.00 (--)
Good or Above	0.46 (0.25-0.85)*	0.40 (0.25-0.65)**
Sensation Seeking		
Low	1.00 (--)	1.00 (--)
High	2.36 (1.75-3.17)**	1.74 (1.30-2.33)**
Depression		
Minimal	1.00 (--)	1.00 (--)
Somewhat Elevated	1.11 (0.84-1.48)	1.78 (1.30-2.44)**
Very Elevated	1.04 (0.52-2.07)	1.66 (1.12-2.45)*
Anxiety Disorder		
None	--	1.00 (--)
Possible Presence	--	2.04 (0.93-4.48)
Parental Connectedness		
Lower	1.00 (--)	1.00 (--)
Higher	0.57 (0.37-0.90)*	0.61 (0.43-0.87)*
School Connectedness		
Lower	---	1.00 (--)
Higher	---	1.07 (0.67-1.72)
Sexual Orientation		
Heterosexual	1.00 (--)	1.00 (--)
Mostly Heterosexual	0.41 (0.23-0.74)*	1.04 (0.71-1.53)
Bisexual	1.08 (0.53-2.20)	0.71 (0.45-1.13)
Mostly Homosexual	0.96 (0.34-2.67)	0.61 (0.21-1.77)
100% Homosexual	0.66 (0.09-4.84)	0.09 (0.02-0.34)*
Unsure	1.31 (0.65-2.62)	0.44 (0.20-0.97)*

*p<0.05
**p<0.001

Table 9. Unweighted percentage and unadjusted odds of past 12-month alcohol use and past 30-day binge drinking (with 95% CI), among high school students (n=6855), by sex and sexual orientation.

Sexual Orientation	Males		Females	
	Alcohol use past 12 months OR (95% CI)	**Binge drinking past 30 days OR (95% CI)**	**Alcohol use past 12 months OR (95% CI)**	**Binge drinking past 30 days OR (95% CI)**
Heterosexual	1.00 (--)	1.00 (--)	1.00 (--)	1.00 (--)
Mostly Heterosexual	1.00 (0.60-1.67)	0.42 (0.22-0.81)*	1.97 (1.23-3.17)*	1.44 (1.04-1.99)*
Bisexual	0.86 (0.39-1.91)	0.93 (0.35-2.45)	1.31 (0.73-2.33)	1.12 (0.72-1.76)
Mostly Homosexual	1.96 (0.66-5.89)	0.39 (0.15-1.07)	1.74 (0.49-6.19)	1.81 (0.67-4.91)
100% Homosexual	1.19 (0.51-2.73)	2.18 (0.91-5.26)	3.07 (0.82-11.5)	0.51 (0.12-2.14)
Unsure	0.47 (0.30-0.73)*	0.53 (0.31-0.92)*	0.31 (0.20-0.48)**	0.26 (0.13-0.52)**

*p<0.05
**p<0.001

Appendix B: Coding of ASDUS Variables

Table I. Coding of alcohol, and alcohol-related harm outcome variables for analyses.

Variable	SDUSAP Question	SDUSAP variable name	SDUSAP coding	Coding for Analyses
Alcohol Use[+]	In the past 12 months, how often did you drink alcohol – beer, wine, coolers or hard liquor (rum, whisky, vodka, gin, etc.)?	aofteta1	Not at all = **1** Just a sip = **2** Once a month or less often = **3** Two or three times a month = **4** Once a week = **5** Twice a week = **6** Three times a week = **7** Four times or five times a week = **8** Almost every day – six or more times a week = **9** Not stated = **99**	Did not drink alcohol = **0** Drank any alcohol = **1**
Binge Drinking[+]	In the past 30 days, how many times have you had five or more drinks of alcohol on the same occasion?	afiveda1	I did not drink alcohol at all in the past 30 days = **1** I have not had five or more drinks of alcohol on the same occasion in the past 30 days = **2** Once, I had five or more drinks of alcohol on the same occasion in the past 30 days = **3** Twice = **4** Three times = **5** Four times = **6** Five or more times = **7** Not stated = **99**	Did not binge drink = **0** Binge drank one or more times = **1**
Problems associated with alcohol use – over the past 12 months[+]	In the past 12 months, has drinking affected your schoolwork or exams so that you did not do as well as you could?	aexamsa1	For each one of the variables Yes = **1** No = **2** I do not drink alcohol = **3** Not stated = **99**	For each one of the variables aexamsa1 to ainjura1, and xupinfa1: No = **0** Yes = **1** For adrivea1 and aaccida1: No to both adrivea1 and aaccida1 = **0** Yes to one or both of adrivea1 and aaccida1 = **1** Any alcohol -elated harms "any_harm": A single variable reflecting any problems associated with alcohol use was created. No to all 10 harms = **0** Yes to one or more harms = **1**
	In the past 12 months, has your drinking caused tension or disagreement with family or friends?	afamtna1		
	In the past 12 months, have you been in trouble with the police as a result of your drinking?	atrblaa1		
	In the past 12 months, has the cost of alcohol caused you to give up buying other things?	acostaa1		
	In the past 12 months, have you consumed alcohol before or instead of breakfast?	abreaka1		

	In the past 12 months, have you damaged things after having drunk alcohol?	adamaga1		Count of alcohol-related harms "harms_count": A count variable with a possible score ranging between **0** and **10**, was created by summing no (0) and yes (1) responses for each alcohol-related harm.
	In the past 12 months, has your drinking caused you to injure yourself?	ainjura1		
	In the past 12 months, how often have YOU driven a motor vehicle within an hour of drinking two or more drinks of alcohol?	adrivea1	Never = **1** Once = **2** Twice = **3** Three or more times = **4** I do not drink alcohol/I do not drive = **5** Not stated = **99**	
	In the past 12 months, have you been in a motor vehicle accident with YOU as the driver, after drinking in the two previous hours?	aaccida1		
	In the past 12 months, did you have unplanned sex under the influence of alcohol or drugs	xupinfa1	Yes = **1** No = **2** Not stated = 99	

[+]Missing data for the main outcomes of interest were excluded from analyses.

Table II. Coding of exposure variables and covariates for analyses.

Variable	SDUSAP Question	SDUSAP Variable Name	SDUSAP Coding	Coding for Analyses
Sex[+]	Are you male or female?	sex	Male = **1** Female = **2** Not stated = **99**	Male = **1** Female = **2**
Sexual Orientation[+]	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?	xoriena1	100% heterosexual (attracted to persons of the opposite sex) = **1** Mostly heterosexual = **2** Bisexual (attracted to both males and females) = **3** Mostly homosexual = **4** 100% homosexual (gay/lesbian; attracted to persons of the same sex) = **5** Not sure = **6** Not stated = **99**	100% heterosexual = **1** Mostly heterosexual = **2** Bisexual = **3** Mostly homosexual = **4** 100% homosexual = **5** Not sure = **6**
Grade	What grade are you in?	grade	Grade 7 = **7** Grade 9 = **9** Grade 10 = **10** Grade 12 = **12**	Grade 9 = **2** Grade 10 = **3** Grade 12 = **4**
Academic Average	So far in this school year, what is your average on all your courses at school?	omarksa1	80%-100% = **1** 70%-79% = **2** 60%-69% = **3** 50%-59% = **4** Below 50% = **5** I do not know = **6** Not stated= **99**	≥80% = **1** <80% = **2** Unknown or Missing = **3**
SES	Imagine this ladder to the right shows how Canadian society is set up. At the top of the ladder are people who are "best off" – they have the most money, the most education and the jobs that bring the most respect. At the bottom are the people who are "worst off" – they have the least money, little education, no job or jobs that no one wants. Now think about your family. Please fill in the bubble next to the box that best shows where your family would be on this ladder.	gcecona1	Worst off = **1** 2 = **2** 3 = **3** 4 = **4** 5 = **5** 6 = **6** 7 = **7** 8 = **8** 9 =9 Best off = **10** Not stated = **99**	Lower SES = **1** Middle SES = **2** Higher SES = **3** Missing = **4**
Importance of Religion	How important would you say religion is to you? Is it:	orelima1	Not important at all = **1** Not very important = **2** Fairly important = **3** Very important = **4** Not stated = **99**	Lower importance = **1** Higher importance = **2** Missing = **3**
Self-Rated Health	In general, would you say your health is:	ghealta1	Excellent = **1** Very good = **2** Good = **3** Fair = **4**	Fair or poor = 1 Good or above = 2 Missing = 3

			Poor = **5** Not stated = **99**	
Cannabis Use	In the past 12 months, how often did you use CANNABIS (marijuana, grass, weed, pot, hash, hash oil)?	aoftmja1	I do not know what cannabis is = **1** I have never used cannabis = **2** I did not use cannabis in the past 12 months = **3** One time = **4** Two times = **5** Three or four times = **6** Five to eight times = **7** Nine to 12 times (about once a month) = **8** Thirteen to 26 times (about twice a month) = **9** Twenty-seven or more times (more than twice a month) = **10** Not stated = **99**	Did not use any cannabis = 1 Used cannabis at least once = 2 Missing = 3

[+]Missing data for the main exposures of interest were excluded from analyses.

Table III. Coding of psychosocial indicator covariates for analyses.

Variable	SDUSAP Question	SDUSAP Variable Name	SDUSAP Coding	Coding for Analyses
Parental Connectedness	My parent(s) or guardian(s) usually know where I am and when I am not home	ofamila1	Strongly agree = **1** Agree = **2** I do not know = **3** Disagree = **4** Strongly disagree = **5** Not stated = **99**	Ofamila1-ofamilc1 were reverse-coded and summed to create a scale from **3** to **15**. The mean + 1 standard deviation amongst all respondents was used as a cut-off point to establish: Lower Connectedness (below mean + 1 standard deviation score) = **1** Higher Connectedness (above mean + 1 standard deviation score) = **2** Indeterminate (any scale items missing) = **3**
	My parents(s) or guardian(s) usually know who I am with when I am not at home	ofamilb1		
	It is important that I do not let down or disappoint my parent(s) or guardian(s)	ofamilc1		
School Connectedness	I feel safe in my school	oconcte1	Strongly agree = **1** Somewhat agree = **2** Somewhat disagree = **3** Strongly disagree = **4** Not stated = **99**	Oconcte1-oconctc1 were reverse coded and summed to create a scale from **3** to **12**. The mean + 1 standard deviation amongst all respondents was used as a cut-off point to establish: Lower Connectedness (below mean + 1 standard deviation score) = **1** Higher Connectedness (above mean + 1 standard deviation score) = **2** Indeterminate (any scale items missing) = **3**
	I feel close to people in my school	oconcta1		
	I feel happy at my school	oconctc1		
Sensation Seeking	I like new and exciting experiences, even if I have to break the rules	mbkrula1	Strongly agree = **1** Somewhat agree = **2** Somewhat disagree = **3** Strongly disagree = **4** Not stated = **99**	Mbkrula1-mfelt7a1 were reverse coded and summed to create a scale from **4** to **16**. The mean + 1 standard deviation amongst all respondents was used as a cut-off point to establish: Lower Sensation Seeking (below mean + 1 standard deviation score) = **1** Higher Sensation Seeking (above mean + 1 standard deviation score) = **2** Indeterminate (any scale items missing) = **3**
	I prefer friends who are exciting and unpredictable	mfrndsa1		
	I like to explore strange places	mexplra1		
	I like to do frightening things	mfelt7a1		
Depression	I did not feel like eating; my appetite	mfelt7a1	Never or rarely = **1** Sometimes = **2**	As per the CESD-12, all items with the exception

	was poor.		Often = **3** Always = **4** Not stated = **99**	of mfelt7f1, mfelt7h1 and mfelt7i1 were re-coded 0-3. The three above items were reverse coded from 0 to 3, so that a higher value represented the absence of that feeling (i.e. not feeling happy, not feeling hopeful and not enjoying life). All 12 items were summed to obtain a scale with range **0** to **36.** Using validated cut-off points, we created the following categorical variable: Minimal (0 to 11) = **1** Somewhat Elevated (12 to 20) = **2** Very Elevated (21 to 36) = **3** Indeterminate (any scale items missing) = **4**
	I felt like I could not shake off the blues even with help from my family or friends.	mfelt7b1		
	I had trouble keeping my mind on what I was doing	mfelt7c1		
	I felt depressed.	mfelt7d1		
	I felt like I was too tired to do things.	mfelt7e1		
	I felt hopeful about the future.	mfelt7f1		
	My sleep was restless.	mfelt7g1		
	I was happy.	mfelt7h1		
	I felt lonely.	mfelt7i1		
	I enjoyed life.	mfelt7j1		
	I had crying spells.	mfelt7k1		
	I felt people disliked me.	mfelt7l1		
Anxiety	I got really frightened for no reason at all.	mflt30a1	Not true = **1** Sometimes true = **2** Often true = **3** Not stated = **99**	Mflt30a1-mflt30e1 were summed to create a scale with values **3** to **15**. As per SCARED scale established cut-offs: No anxiety disorder (scores of 5 to 7) = **1** Possibility of anxiety disorder (8 to 15) = **2** Indeterminate (any scale items missing) = **3**
	I was afraid to be alone in the house.	mflt30b1		
	People told me that I worry too much.	mflt30c1		
	I was scared to go to school.	mflt30d1		
	I was shy.	mflt30e1		