



Canadian Centre
on Substance Abuse
Centre canadien de lutte
contre les toxicomanies

Partnership. Knowledge. Change.
Collaboration. Connaissance. Changement.

www.ccsa.ca • www.cclt.ca

Urban and Rural Student Substance Use

Technical Report

September 2015

Opal A. McInnis, MSc

Research and Policy Analyst, Canadian Centre on Substance Abuse

Matthew M. Young, PhD

Senior Research and Policy Analyst, Canadian Centre on Substance Abuse

Student Drug Use Surveys Working Group

Urban and Rural Student Substance Use

Technical Report

This document was published by the Canadian Centre on Substance Abuse (CCSA).

Suggested citation: McInnis, O.A., Young, M.M., Saewyc, E., Jahrig, J., Adlaf, E., Lemaire, J., Taylor, S., Pickett, W., Stephens, M., Di Gioacchino, L., Pica, L., Levin, D., Tonita, A., Wang, H., & Xiong, H. (2015). *Urban and Rural Student Substance Use*, Ottawa, Ont.: Canadian Centre on Substance Abuse.

© Canadian Centre on Substance Abuse, 2015.

CCSA, 500–75 Albert Street
Ottawa, ON K1P 5E7
Tel.: 613-235-4048
Email: info@ccsa.ca

Production of this document has been made possible through a financial contribution from Health Canada. The views expressed herein do not necessarily represent the views of Health Canada.

The Student Drug Use Surveys Working Group would like to thank Manon Mireault of the Office of Research and Surveillance, Controlled Substances and Tobacco Directorate, Healthy Environments and Consumer Safety Branch, Health Canada for contributing the Youth Smoking Survey data and attending working group meetings in an observer and advisory capacity.

This document can also be downloaded as a PDF at www.ccsa.ca

Ce document est également disponible en français sous le titre :

Consommation de substances chez les élèves en milieu rural ou urbain

ISBN 978-1-77178-289-0



Table of Contents

Executive Summary	1
Background.....	1
Methods	1
Results	2
Implications.....	2
Conclusions and Next Steps	3
Introduction	4
Urban versus Rural Settings	4
Substance Use in Urban versus Rural Settings.....	4
The Student Drug Use Surveys Working Group	5
Methods.....	6
Defining Rurality	6
Analytic Strategy	6
Outcome Variables	7
Differences in Contributing Surveys.....	7
Results.....	8
Alcohol.....	8
Alcohol Use.....	8
Consumption of 5+ Drinks on a Single Occasion	9
Driving after Alcohol Use	10
Cannabis Use.....	11
Daily or Almost Daily Cannabis Use	12
Driving after Cannabis Use.....	13
Illicit Drug Use.....	14
Prescription Drug Abuse.....	15
Survey Specific Analyses	15
Summary of Findings.....	16
Discussion	17
Alcohol.....	17
Drinking and Driving.....	17
Cannabis Use.....	18
Cannabis Use and Driving.....	18
Illicit Drug Use and Prescription Abuse	18
Implications.....	18
Limitations and Strengths.....	19
Future Research	20
Conclusion	20
References	21
Appendix A: Operational Definition of Rural	24
Appendix B: Question Wording and Comparisons in Predictors Used in the Logistic Regression Analysis	25
Appendix C: Common Outcomes across the Surveys: Methods of Assessment.....	26
Appendix D: Survey Design Variables of Contributing Surveys	30
Appendix E: Odds Ratios with 95% Confidence Intervals for Bivariate and Multivariate Models.....	31



Opal A. McInnis, MSc

Research and Policy Analyst
Canadian Centre on Substance Abuse

Matthew M. Young, PhD

Senior Research and Policy Analyst
Canadian Centre on Substance Abuse
Adjunct Research Professor of Psychology
Carleton University

Student Drug Use Surveys (SDUS) Working Group

Current members of the SDUS Working Group in order of membership seniority

Elizabeth Saewyc, PhD, RN (Co-Chair)

University of British Columbia School of Nursing
McCreary Centre Society, British Columbia

Jesse Jahrig (Co-Chair)

Alberta Health Services

Ed Adlaf, PhD

Centre for Addiction and Mental Health

Jackie Lemaire

Addiction Foundation of Manitoba

Stacy Taylor

Department of Health New Brunswick

William Pickett, Ph.D.

Faculty of Health Sciences, Queen's University

Michael Stephens

Canadian Centre on Substance Abuse

Lisha Di Gioacchino

Canadian Centre on Substance Abuse

Lucille Pica

Institut de la statistique du Québec

Daniel Levin

Addiction Foundation of Manitoba

Adam Tonita

Alcohol and Drug Education and Prevention
Directorate, Community Care Branch, Ministry of
Health, Saskatchewan

Hao Wang

Department of Health New Brunswick

Hui Xiong

Newfoundland and Labrador Centre for Health
Information



Executive Summary

Background

Differences in economic, cultural, social and educational factors between urban and rural areas in Canada might influence behavioural and mental health outcomes. However, most research assessing differences in urban and rural patterns of substance use has been conducted in the United States. Within Canada, information is limited on whether students who attend urban and rural schools differ in substance use. To address this gap, this report analyzes data from regularly occurring student surveys and outlines differences and similarities between students who attend urban and rural schools. Though this report is technical in nature, it has implications for a broader audience such as those working in prevention programming and schools, and others who work with youth. Understanding differences in Canada between adolescent students in urban and rural communities can help guide best practices in prevention programs for schools and communities.

Methods

To develop a picture of student substance use across Canada, and to help understand differences in students who attend urban and rural schools, data from regularly occurring student surveys were contributed to the Canadian Centre on Substance Abuse (CCSA) by members of the Student Drug Use Surveys (SDUS) Working Group. The SDUS group represents jurisdictions with dedicated programs of reliable, valid, regularly occurring, provincial or national student surveys. The SDUS members contributed data from the following surveys:

- British Columbia Adolescent Health Survey (2013)
- Alberta data from the Youth Smoking Survey (2012–2013)
- Alcohol and Other Drugs: Students in Manitoba survey (2007)
- Quebec Survey of Smoking, Alcohol, Drugs and Gambling in High School Students (2013)
- Student Drug Use Survey in the Atlantic Provinces:
 - Newfoundland and Labrador (2012)
 - New Brunswick (2012)
- National data from the Youth Smoking Survey (YSS) (2012–2013)
- Health Behaviour in School-Aged Children (HBSC) survey (2009–2010)

Rurality was determined using school postal codes and defined using the statistical area classification system developed by Statistics Canada (2001). Estimates were provided by each survey for urban and rural settings to determine approximate prevalence rates for the following outcomes: alcohol use, drinking five or more drinks on a single occasion, driving after alcohol or cannabis use, cannabis use, daily or almost daily cannabis use, illicit drug use, and prescription drug abuse. Second, these same outcomes were assessed by each contributing survey using multivariate logistic regressions controlling for sex, grade level (or age), with grades assessed ranging from seven to 12 depending on the survey, and socioeconomic status to determine if they differed as a function of whether students attended school in an area defined as urban or rural.



Results

Overall, the most consistent findings were related to alcohol use and associated risk behaviours. Seven out of eight of the contributing surveys indicated that students who attended schools in rural settings were more likely to report alcohol use. Students who attended rural schools were also more likely to report drinking five or more drinks on a single occasion with five out of the eight surveys observing a significant effect. Of the surveys that assessed drinking and driving, three out of four reported that students in a rural setting were more likely to report driving after consuming alcohol.

Rural students were also found to be more likely to drive after using cannabis according to three of the four surveys that assessed this outcome. Findings with respect to cannabis use in general, however, were mixed, with three out of eight surveys indicating students who attended school in a rural setting were more likely to report cannabis use. Only two of eight surveys found that students who attended rural schools were at increased likelihood of daily or almost daily cannabis use.

Finally, reports of differences in illicit drug use (other than cannabis) among students in urban versus rural settings were mixed, with only three out of the eight surveys finding that students who attended rural schools were more likely to report this outcome. Prescription drug abuse did not vary appreciably by setting as only one out of seven surveys observed a significant effect.

None of the eight surveys drawn on for this report found that urban students were more likely to report any of the outcomes explored.

Implications

The current report has implications for the way communities and schools in rural settings address youth alcohol use and associated risk behaviour prevention. School boards might want to ask if rural students have equal access to the treatment and prevention resources and services available to their urban counterparts. Further research might explore if it is beneficial to provide additional or specialized training for those responsible for youth drug use prevention services in rural settings. The question of access for rural youth to services and resources for risky substance use should be asked to determine if alternative treatment and prevention methods of delivery might be beneficial in rural schools. Some studies have suggested that increased substance use among rural youth could be due to limited access to drug education and treatment services that might be available in more populated centres (Conger, 1997; DeVoe, Krois, & Stenger, 2009).

Other recommendations include examining the infrastructure of rural communities to assess whether disparities exist between these communities and urban settings with respect to part-time job opportunities, sport, music, clubs and so on. Building capacity within communities to enhance various protective factors (e.g., extracurricular activities) and to limit risk factors (e.g., negative social influences) should always be considered in initiatives aimed at preventing youth substance use (Canadian Centre on Substance Abuse, 2010; United Nations Office on Drugs and Crimes, 2013). It would also be helpful to examine further how students travel from parties, schools and other events in an effort to assess what can be done to support easier access to safe transportation for rural youth. Finally, engaging youth in the development of preventive approaches might provide the most effective way to initiate change.

These suggestions are speculative and further evidence is required to determine the effectiveness of these approaches in preventing or reducing substance use and associated risky behaviours among rural students. While rural students appeared to be at greater risk of reporting substance use and risk behaviours as compared to urban students, urban students continue to use substances and the need to improve prevention efforts for all youth remains.



Conclusions and Next Steps

Together, national and provincial data indicate that students who attend schools in rural settings are at increased likelihood of reporting certain outcomes related to substance use, predominantly those pertaining to alcohol use and associated risk behaviours. Longitudinal data are needed to determine whether the differences in rural student substance use and risky behaviours observed in this report are linked to later health disparities in urban versus rural communities. These findings are an essential first step towards obtaining a cross-Canada picture of urban-rural student differences and point to key areas where drug prevention strategies could be tailored for rural youth.



Introduction

The substances Canadian youth ages 15–19 most commonly reported using are alcohol (60%), cannabis (22%), psychoactive pharmaceutical drugs (non-medical use; 10%) and hallucinogens (3.0%) (Statistics Canada, 2015). Risky behaviours associated with substance use have also been reported among Canadian students. Among adolescent drivers in grades 10–12 in Ontario, 4% reported driving after the consumption of alcohol and close to 10% had driven after smoking cannabis (Boak, Hamilton, Adlaf, & Mann, 2013). Despite the prevalence of alcohol and drug use among youth, there are under-investigated factors that might influence the prevalence and harms of substance use among youth. For instance, Canada-wide data are lacking on whether the prevalence and harms of alcohol and other drugs differ between youth living in urban versus rural settings.

Urban versus Rural Settings

Differences related to economic, cultural, social and educational factors across urban versus rural areas could influence behavioural and mental health outcomes. For example, rural adults living on farms report greater levels of anxiety and depressive symptoms, as well as an increased risk of suicide (Gregoire, 2002; Sanne, Mykletun, Moen, Dahl, & Tell, 2004), while adults living in urban settings appear to be at a greater risk of developing schizophrenia (van Os, Kenis, & Rutten, 2010). There have also been differences observed in urban-rural patterns of substance use, but this research has been mainly conducted among American students. To date, there has been no cross-Canadian research conducted to determine whether there are differences in prevalence and harms of alcohol and other drug use between students living in urban versus rural settings and, if differences exist, what approaches are needed to promote health equity related to substance use.

Substance Use in Urban versus Rural Settings

Most research assessing urban-rural patterns of substance use has been conducted in the United States. Though illicit drug use among those living in rural settings has historically been viewed as less common than those in urban settings (Pruitt, 2009), in recent years illicit drug use in rural regions of the United States has caught up to or in some instances exceeded that of urban and suburban communities (Dew, Elifson, & Dozier, 2007). There is also evidence that the rate of drug deaths related to heroin, cocaine and opioid analgesic in the United States has been increasing more rapidly in rural compared to urban areas (248% vs. 16%; Paulozzi & Xi, 2008).

Among American youth, those living in a rural setting are more likely to report use of alcohol, compared to those living in urban areas (Coomber et al., 2011; Hanson et al., 2009; National Center on Addiction and Substance Abuse, 2000; Rhew, Hawkins, & Oesterle, 2011). The former group is also more likely to report heavy drinking on one occasion and risk behaviours, such as drinking and driving, or driving under the influence of illicit drugs (Cronk & Sarvela, 1997; Lambert, Gale, & Hartley, 2008).

Findings are somewhat mixed for substances other than alcohol, with some reports indicating higher use levels of drugs such as cannabis, methamphetamines, cocaine and inhalants among youth living in rural settings (Aronson, Feinberg, & Kozlowski, 2009; Coomber et al., 2011; Gfroerer, Larson, & Colliver, 2007; Lambert et al., 2008; National Center on Addiction and Substance Abuse, 2000; Rhew et al., 2011). Others report greater levels of illicit substance use in urban populations (Hanson et al., 2009). Still others report no urban-rural differences in illicit substance use (Cronk & Sarvela, 1997); for instance, the 2013 Monitoring the Future Survey (the U.S. national school-based survey) indicated there has not been any appreciable or consistent data to suggest differences in adolescents'



illicit substance use associated with population density (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2014). Across these studies operational definitions for “urban” and “rural” settings vary substantially and so comparisons of these findings should be interpreted with caution.

Canadian information is limited on whether urban and rural differences exist in relation to substance use. Analysis of the 2001–2002 Health Behaviour in School-Aged Children (HBSC) survey indicated that adolescents (11–15 years of age) living in rural areas consume a greater amount of alcohol and were at a greater risk of alcohol-related injuries compared to their urban counterparts (Jiang, Li, Boyce, & Pickett, 2008). Similarly, a recent report that examined data collected from the HBSC survey indicated that adolescent students who were living in rural regions closer to metropolitan areas had higher rates of prescription drug misuse (Pulver, Davison, & Pickett, 2014). Other reports have indicated that rural Canadian youth might be more likely to engage in risky behaviours such as riding in a car with an individual who had used alcohol or cannabis (Leadbeater, Foran, & Grove-White, 2008; Poulin, Boudreau, & Asbridge, 2006).

The 2011 Ontario Student Drug Use and Health Survey indicated that compared to urban and suburban students, those in rural areas reported greater use of alcohol, methamphetamine and non-medical use of prescription opioid pain relievers for non-medical purposes, over-the-counter cold medication and stimulants. In contrast, urban and suburban students were more likely to report using inhalants compared to rural students. Importantly, students in rural areas were more apt to report drinking and driving, or being a passenger in a vehicle with a driver who had been drinking alcohol (Centre for Addiction and Mental Health, 2012). Likewise, data from the HBSC survey also indicated that students were at increased risk of operating a motor vehicle after using alcohol, cannabis or illicit drugs if they were from a rural community (Pickett et al., 2012). These findings underscore the importance of further delineating urban and rural differences among Canadian youth to inform the development of effective, context-specific prevention and treatment programs.

To better understand whether urban-rural differences exist in substance use among Canadian students, representatives from the eight regularly occurring student surveys or health surveys which assess drug and alcohol use, agreed to re-analyze data from their surveys. National estimates were provided by the HBSC survey and the Youth Smoking Survey (YSS). This analysis will describe similarities and differences in alcohol and other drug use between students who attend schools in rural and urban settings, and make suggestions about how programs can address these differences through effective context-specific practices in substance use prevention and treatment.

The Student Drug Use Surveys Working Group

The Canadian Centre on Substance Abuse (CCSA) was given the mandate under Canada's renewed National Anti-Drug Strategy to work with an expert group to support the collection of student drug use data in provinces and territories. The Student Drug Use (SDUS) Working Group was formed, consisting of representatives from jurisdictions with dedicated programs of reliable, valid, regularly occurring, provincial or national student surveys. In December, 2012 under its new mandate, the SDUS Working Group decided that the great diversity of questions asked and data collected by the various surveys offered an opportunity to explore more specific questions about student drug use across Canada. The working group decided that it would focus on specific research topics of interest. The first topic the group chose to assess was the prevalence and harms of substance use among students who attend schools in urban and rural settings.



Methods

In an effort to develop a picture of student substance use across Canada, and to allow for an understanding of urban and rural differences, data from regularly occurring student surveys were contributed by members of the SDUS Working Group. These include the British Columbia: Adolescent Health Survey (2013); Alberta data from the Youth Smoking Survey (2012–2013); the Alcohol and Other Drugs: Students in Manitoba Survey (2007); the Quebec Survey of Smoking, Alcohol, Drugs and Gambling in High School Students (2013); the Student Drug Use Survey in the Atlantic Provinces (data collected from Newfoundland and Labrador, and New Brunswick in 2012); as well as national-level data from Health Canada’s Youth Smoking Survey (YSS) (2012–2013) and the Health Behaviour in School-Aged Children (HBSC) survey (2009–2010).

Defining Rurality

Rurality was determined according to the postal codes of the various school locations. “Urban” versus “rural” participants were defined using the statistical area classification system developed by Statistics Canada. (See Appendix A for more information.) Therefore, this report assesses differences in students who attend schools located in urban versus rural settings and does not necessarily reflect differences in students who live in urban or rural communities. The category “rural” encompassed rural and remote communities and small towns. A binary classification scheme of urban and rural – rather than a scheme using more than two categories or a continuous measure – was chosen in an effort to limit the complexity of the results from multiple surveys and to avoid the complex interpretation that would have been required for multiple categories across urban-rural regions from eight different surveys.

Analytic Strategy

In March 2014, the SDUS working group developed a common model to conduct analyses across multiple jurisdictional and national surveys. First, estimates were provided by each survey for urban and rural settings to determine approximate prevalence rates of alcohol and other drug use and associated risk behaviours. Second, working group members from each contributing survey conducted a multivariate logistic regression to control for sex, age (or grade level as a proxy for age) and socioeconomic status to determine if agreed-upon common outcomes (outlined below) differed as a function of whether students attended a school in an area defined as urban or rural. Socioeconomic status was operationally defined differently across the surveys. Grade levels ranged from seven to 12 depending on the survey. Differences among surveys can be found in Appendix B.

Data are presented in odds ratios. Significance was determined using 95% confidence intervals. All analyses accounted for the clustered nature of the study design. To aid in the understanding and interpretation of the odds ratios, size of odds ratios are grouped into categories and labelled low, moderate or high. These categories are based on previous studies that have used a similar categorization of odds ratios (e.g., Iles, Davidson, Taylor, & O’Halloran, 2009). However, these qualitative labels should be interpreted cautiously. Direct comparisons of odds ratios generated from the participating surveys are not appropriate due to variations in survey sampling and methodology. The median (i.e., the value separating the higher half of the data from the lower half) and range of each outcome is also provided to allow for an approximation of prevalence for each indicator. However, survey-specific estimates of prevalence are not provided to limit comparisons across the surveys; such comparison would be problematic because of differences in sampling and methodology across surveys.



Outcome Variables

Though there was considerable variability in questionnaire wording among contributing surveys, the following common outcomes were agreed-upon by the SDUS Working Group and assessed (see Appendix C for information about variables specific to the individual surveys):

Alcohol use refers to the proportion of students who reported using alcohol. British Columbia assessed past 30-day use, whereas all other surveys assessed alcohol use in the past 12 months.

Cannabis use refers to the proportion of students who reported using cannabis. British Columbia assessed past 30-day use, whereas all other surveys assessed use in the past 12 months.

Illicit drug use (excluding cannabis and prescription drugs) refers to the proportion of students who reported using illicit drugs. British Columbia and HBSC assessed lifetime prevalence, whereas all others assessed use in the past 12 months.

Prescription drug abuse refers to the proportion of students who reported abusing prescription drugs at least once in the past 12 months.¹ British Columbia assessed lifetime use, whereas all other surveys assessed use in the past 12 months.

Driving after alcohol use refers to the proportion of students who reported driving after alcohol use.^{1,2} New Brunswick and Newfoundland and Labrador assessed past 12 months of driving within an hour of consuming alcohol, whereas the other surveys that measured this indicator assessed lifetime occurrence.

Consumption of 5+ drinks on a single occasion refers to the proportion of students who reported five or more drinks on a single occasion in the past year (HBSC, YSS, Alberta (YSS), Manitoba and Quebec) or past 30 days (British Columbia, Newfoundland and Labrador, and New Brunswick) (see Appendix C for wording specific to the individual surveys).

Daily or almost daily use of cannabis refers to the proportion of students who reported daily or almost daily use of cannabis. British Columbia and HBSC assessed use in the past 30-days, whereas all other surveys assessed past 12-month usage.

Driving after cannabis use refers to the proportion of students who reported driving after cannabis use.² New Brunswick and Newfoundland and Labrador assessed the occurrence of driving within an hour of cannabis use in the past 12 months, whereas the other surveys assessed lifetime occurrence.

Differences in Contributing Surveys

Differences in survey design methodologies across the provinces can affect estimates. These differences include whether all school districts participate, who administers the survey (e.g., teachers, public health nurses, research staff), and how well students trust that their answers will be maintained in confidence. Differences in samples sizes and other methodological factors among the surveys can be found in Appendix D.

¹ Data not available for Quebec

² Data not available for national and Alberta analysis of the YSS or HBSC.



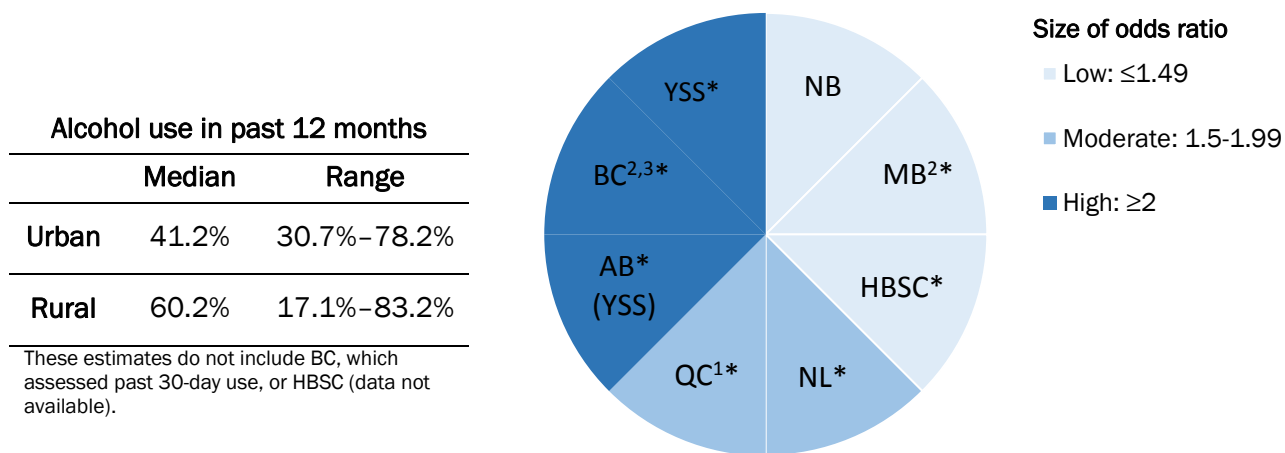
Results

Alcohol

Alcohol Use

All provincial and national student surveys asked about alcohol use. The median prevalence of alcohol use in the past 12 months for students who attended urban schools was 41.2% (range of surveys: 30.7%–78.2%) and for students who attended rural schools it was 60.2% (range of surveys: 17.1%–83.2%) (estimates do not include BC or HBSC). Logistic regression analyses indicated that across all surveys (except New Brunswick), attending a rural school was associated with significantly greater odds of past-year alcohol use compared to urban-schooled students (Figure 1).

Figure 1. Differences in alcohol use between students attending schools in urban and rural settings



The pie charts represent all surveys contributing analyses for alcohol use. Size of odds ratios are indicated by colour. Where effects are noted, students who attended rural schools were more likely to report alcohol use. * Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹ Also accounted for the weekly amount of money students reported having, as well as their self-reported school performance.

² Did not account for socioeconomic status.

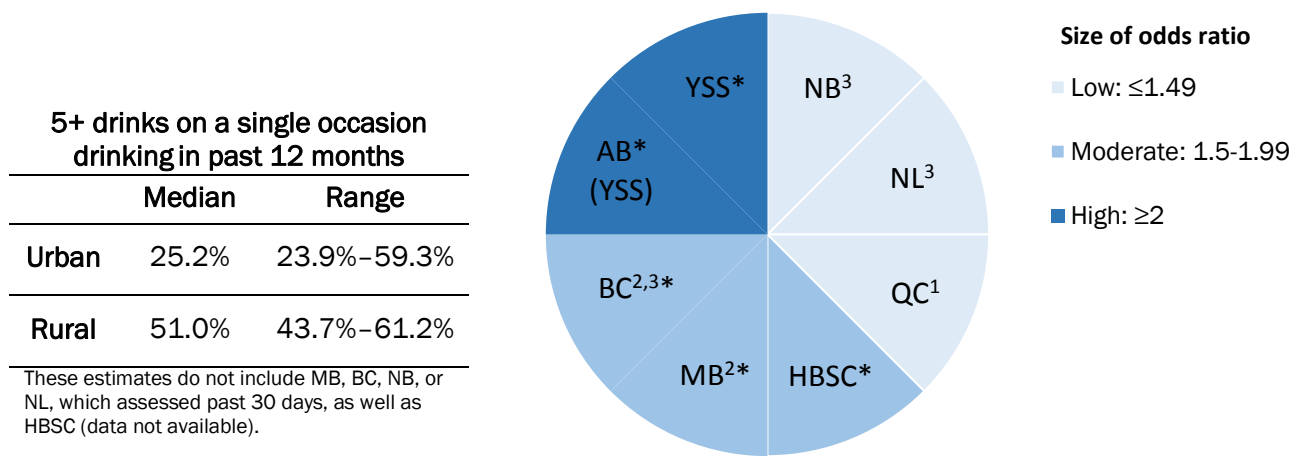
³ Assessed past 30-day use whereas all other surveys assessed alcohol use in the past 12 months although the comparisons made varied slightly (see Appendix C for other slight variations).



Consumption of 5+ Drinks on a Single Occasion

The median prevalence of consuming five or more drinks on a single occasion among students from urban schools was 25.2% (range of surveys: 23.9%–59.3%) and for students from rural schools it was 51.0% (range of surveys: 43.7%–61.2%) (estimates do not include MB, BC, NB, NL or HBSC). Findings were mixed with respect to whether rural students were at an increased risk of consuming five or more drinks on a single occasion with five of the eight surveys reporting this association as significant (Figure 2).

Figure 2. Differences in consumption of five or more drinks on a single occasion between students attending schools in urban and rural settings



The pie charts represent all surveys contributing analyses for consumption of five or more drinks on a single occasion. Size of odds ratios are indicated by colour. Where effects are noted, students who attended rural schools were more likely to report 5+ drinks on a single occasion drinking.

* Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹ Also accounted for the weekly amount of money students reported having, as well as their self-reported school performance.

² Did not account for socioeconomic status.

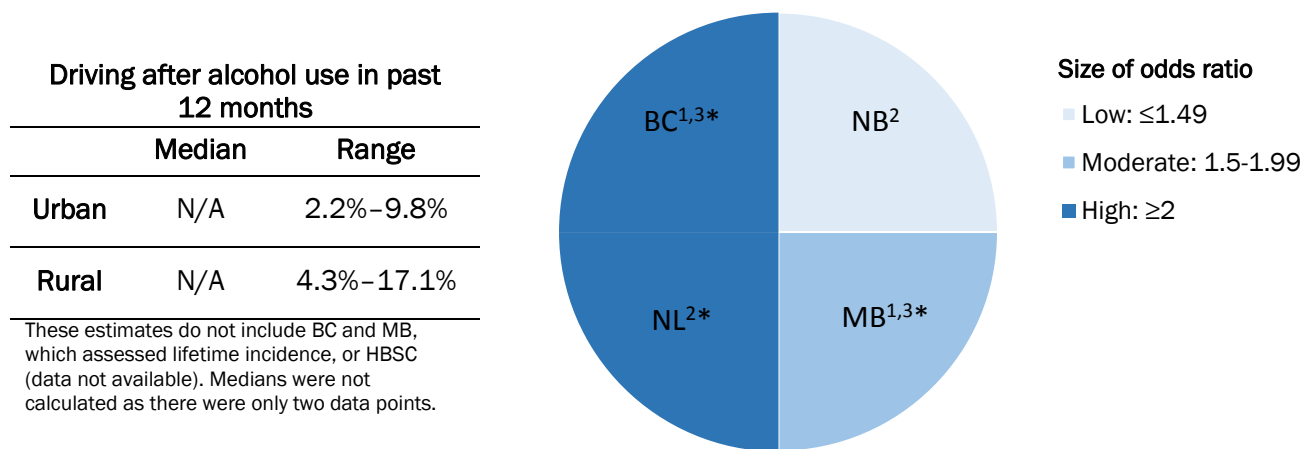
³ Assessed past 30-day excessive drinking whereas all other surveys assessed excessive drinking in the past-12 months (see Appendix C for other slight variations).



Driving after Alcohol Use

The median prevalence of driving after alcohol use in the past 12 months was not calculated as there were only two data points that measured past-year incidence of this behaviour (NB and NL, whereas BC and MB assessed lifetime incidence). The range of past 12-months driving after alcohol use among students who attended urban schools was 2.2%–9.8%, and for students who attended rural schools it was 4.3%–17.1% (estimates do not include MB, BC or HBSC). Three of the four surveys that assessed driving after drinking indicated students who attended school in a rural setting had greater odds of engaging in this behaviour than those who attended school in an urban setting (Figure 3). Data from the HBSC survey were not included in the figure as a combined question was used to assess past 30-days driving after drinking alcohol, using marijuana or illegal drugs. In line with other findings, results indicated that rural students also had significantly greater odds of reporting this combined outcome of substance use and driving (odds ratio = 2.07 [1.57–2.71]).

Figure 3. Differences in driving after alcohol use between students attending schools in urban and rural settings



These estimates do not include BC and MB, which assessed lifetime incidence, or HBSC (data not available). Medians were not calculated as there were only two data points.

The pie charts represent all surveys contributing analyses for driving after alcohol use. Size of odds ratios are indicated by colour. Where effects are noted, students who attended rural schools were more likely to report driving after drinking alcohol.

* Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹ Did not account for socioeconomic status.

² Assessed past 12 months of driving within an hour of consuming alcohol.

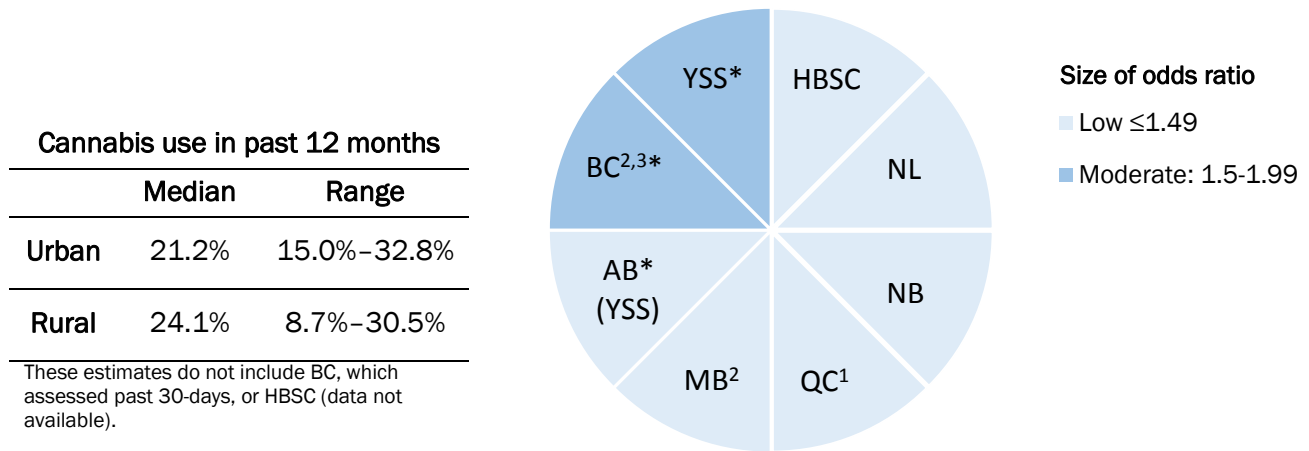
³ Assessed lifetime prevalence of driving after alcohol consumption (see Appendix C for other slight variations).



Cannabis Use

Based on data from provincial and national student surveys, the median prevalence of cannabis use in the past 12 months among those attending school in an urban setting was 21.2% (range of surveys: 15.0%–32.8%). The corresponding figure for those attending rural schools was 24.1% (range of surveys: 8.7%–30.5% (estimates do not include BC or HBSC)). Most surveys indicated that school setting was not associated with past-year cannabis use. However, the national YSS, the Alberta component of the YSS, as well as the British Columbia survey, found rural students had greater odds of cannabis use. Of note here, however, is that the British Columbia survey assessed past 30-day cannabis use (Figure 4).

Figure 4. Differences in cannabis use between students attending schools in urban and rural settings



These estimates do not include BC, which assessed past 30-days, or HBSC (data not available).

The pie charts represent all surveys contributing analyses for cannabis use. Size of odds ratios are indicated by colour. Where effects are noted, students who attended schools were more likely to report cannabis use.

* Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹ Also accounted for the weekly amount of money students reported having, as well as their self-reported school performance.

² Did not account for socioeconomic status.

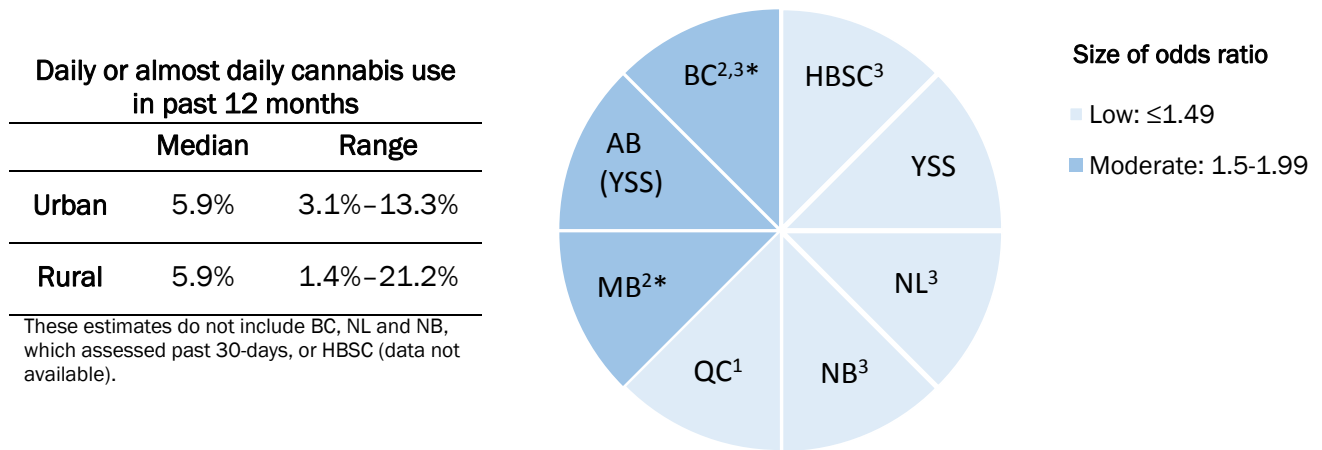
³ Assessed past 30-days whereas all other surveys assessed past 12-months (see Appendix C for other slight variations).



Daily or Almost Daily Cannabis Use

The median prevalence of past-year daily or near daily cannabis was the same across students who attended urban (5.9%; range of surveys: 3.1%–13.3%) and rural schools (5.9%; range of surveys: 1.4%–21.2%) (estimates do not include BC, NB, NL or HBSC). The data indicated that there was no consistent association between students who attended school in an urban versus rural setting on daily or near daily use of cannabis as only two (Manitoba and British Columbia) of the eight surveys indicated that students who attended a rural school had greater odds of reporting daily or near daily cannabis use (Figure 5).

Figure 5. Differences in daily or almost daily cannabis use between students attending schools in urban and rural settings



These estimates do not include BC, NL and NB, which assessed past 30-days, or HBSC (data not available).

The pie charts represent all surveys contributing analyses for daily or almost daily cannabis use. Size of odds ratios are indicated by colour. Where effects are noted, students who attended rural schools were more likely to report daily or near daily use of cannabis.

* Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹Also accounted for the weekly amount of money students reported having, as well as their self-reported school performance.

²Did not account for socioeconomic status.

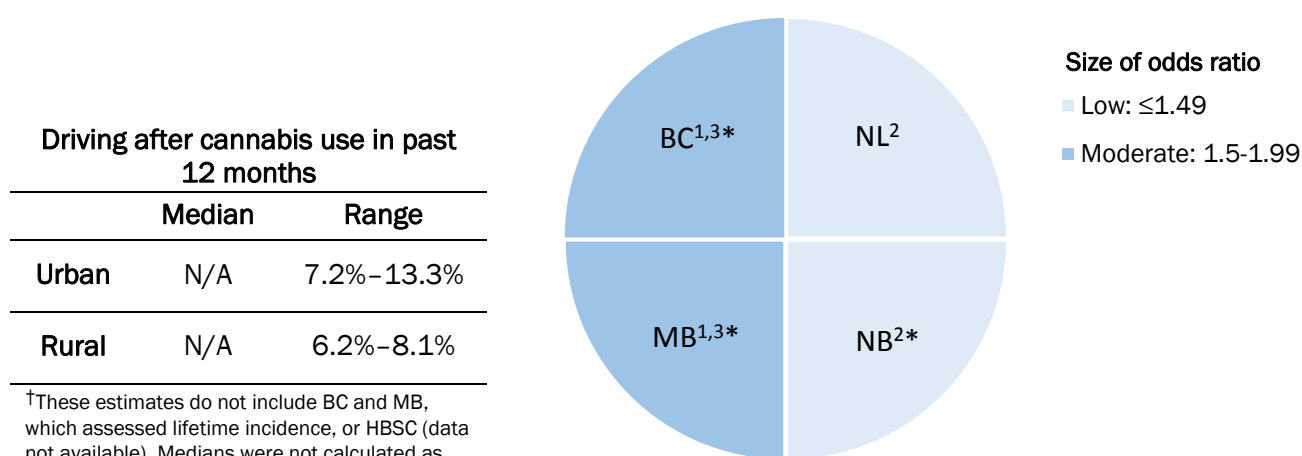
³Assessed past 30-days whereas all other surveys assessed past 12-months (see Appendix C for other slight variations).



Driving after Cannabis Use

The median prevalence of driving after cannabis use in the past 12 months is not provided as there were only two data points that measure past-year incidence of this behaviour (NB and NL, whereas BC and MB assessed lifetime incidence). The range of driving after cannabis use among urban students was 7.2%–13.3%; among rural students, the range was 6.2%–8.1% (estimates do not include BC, MB or HBSC). Multivariate logistic regression analyses indicated that attending a rural school appeared to be associated with greater odds of driving after cannabis use in three of the four surveys that provided data on this measure (Figure 6).

Figure 6. Differences in driving after cannabis use between students attending schools in urban and rural settings



†These estimates do not include BC and MB, which assessed lifetime incidence, or HBSC (data not available). Medians were not calculated as there were only two data points

The pie charts represent all surveys contributing analyses for driving after cannabis use. Size of odds ratios are indicated by colour. Where effects are noted, students who attended rural schools were more likely to report driving after cannabis use.

* Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹ Did not account for socioeconomic status.

² Assessed past 12 months of driving within an hour of using cannabis.

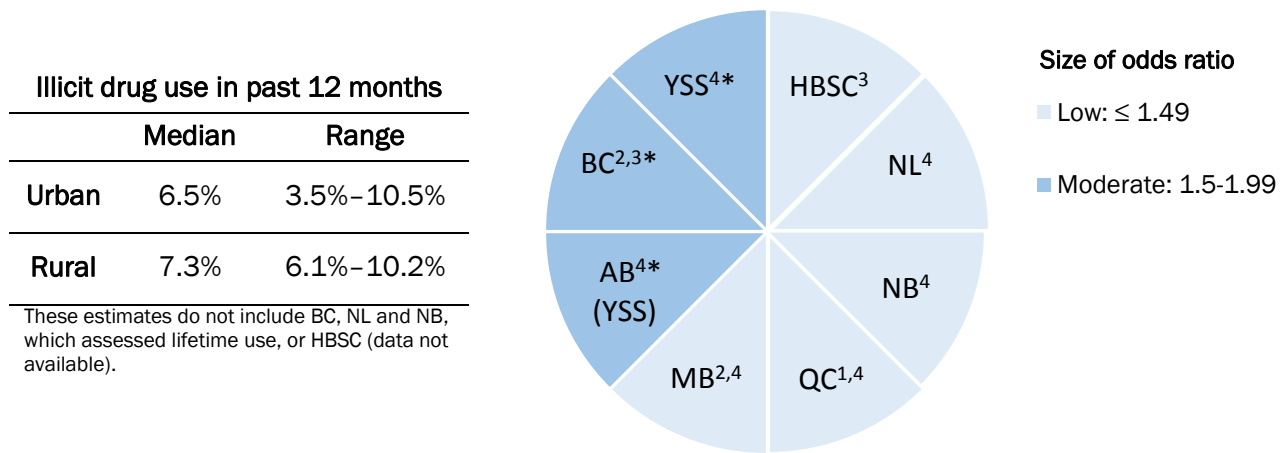
³ Assessed lifetime prevalence of driving after using cannabis (see Appendix C for other slight variations).



Illicit Drug Use

All surveys assessed illicit drug use (other than cannabis). The median prevalence of past-year illicit drug use among urban students was 6.5% (range of surveys: 3.5%–10.5%) compared with 7.3% (range of surveys: 6.1%–10.2%) of rural students (estimates do not include BC, NB, NL or HBSC). Most surveys indicated no urban-rural drug differences; however results revealed that the surveys found that the odds of illicit drug use was greater for students who attended a rural-school than those who attended an urban school in the YSS, the Alberta component of the YSS and the British Columbia surveys (Figure 7).

Figure 7. Differences in illicit drug use between students attending schools in urban and rural settings



The pie charts represent all surveys contributing analyses for illicit drug use. Size of odds ratios are indicated by colour (see legend). Where effects are noted, students who attended rural schools were more likely to report illicit drug use.

* Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹ Also accounted for the weekly amount of money students reported having, as well as their self-reported school performance.

² Did not account for socioeconomic status.

³ Assessed lifetime use.

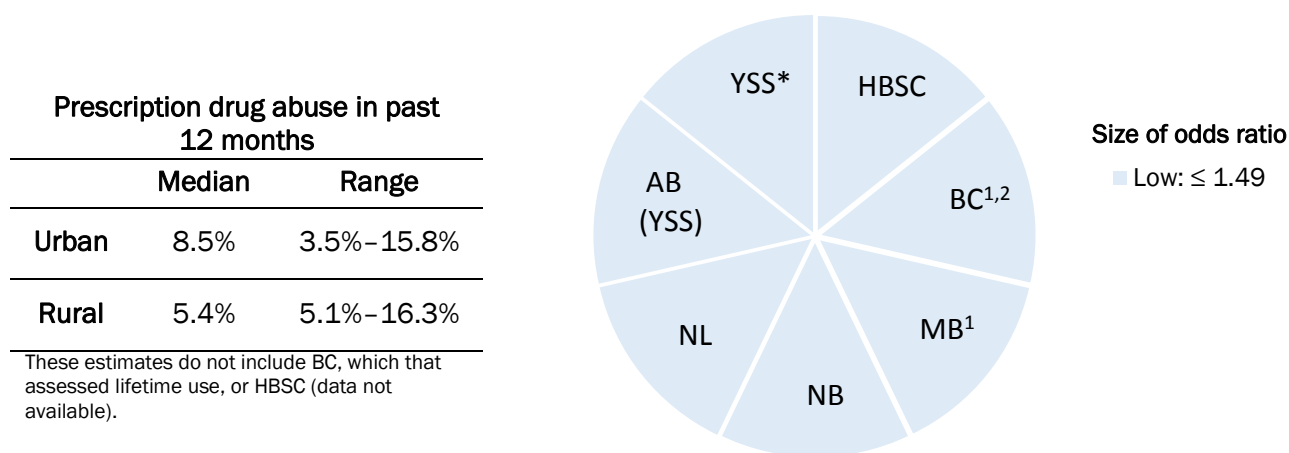
⁴ Assessed past 12-months use (See Appendix C for other slight variations).



Prescription Drug Abuse

The median prevalence of past-year prescription drug abuse was 8.5% (range of surveys: 3.5%–15.8%) and 5.4% (range of surveys: 5.1%–16.3%) among students who attended urban and rural schools, respectively (estimates do not include BC or HBSC). Similar to what was observed with illicit drug use, no consistent urban-rural differences were observed with respect to rates of prescription drug abuse. Only one of the YSS found that students who attended rural-schools had greater odds of reporting prescription drug abuse (Figure 8).

Figure 8. Differences in prescription drug abuse between students attending schools in urban and rural settings



The pie charts represent all surveys contributing analyses for prescription drug abuse. Size of odds ratios are indicated by colour (see legend). Where effects are noted, students who attended rural schools were more likely to report prescription drug abuse.

*Indicates a significant odds ratio ($p < .05$) of urban-rural environment on the outcome.

¹Did not account for socioeconomic status.

²Assessed lifetime use whereas all other surveys assessed past 12-months use (See Appendix C for other slight variations).

Survey Specific Analyses

Some of the contributing surveys assessed additional outcomes to determine if they varied as a function of whether students attended school in an urban or rural setting. Regarding other alcohol-relevant outcomes, the HBSC observed that rural students were at greater odds of being a passenger in a vehicle in which the driver was under the influence of drugs or alcohol (odds ratio = 1.53 [1.24–1.88]). Likewise, the YSS observed that rural students were also at greater odds of reporting riding in a car driven by someone (including themselves) who was high or had been using alcohol or other drugs (odds ratio = 1.75 [1.49–2.06]). Newfoundland and Labrador also observed that students who attended a rural school were at greater odds of drinking in a licensed venue (odds ratio = 1.5 [1.1–2.1]), but did not find any urban-rural differences in alcohol-related self-injury (odds ratio = 0.8 [0.5–1.2]) or self-injury caused by drug use (odds ratio = 1.7 [1.0–2.8]).



Summary of Findings

Table 1. Summary of the results of multivariate logistic regressions examining urban-rural differences in substance use and associated risk behaviour outcomes

	Size of Odds Ratio <ul style="list-style-type: none"> Low: ≤1.49 Moderate: 1.5-1.99 High: ≥2 	Number of surveys indicating rural students were at a significantly greater odds ($p < .05$) of reporting out of total number of surveys assessing the outcome*
Alcohol Use		7 out of 8 surveys
Consumption of 5+ drinks on a single occasion		5 out of 8 surveys
Driving after alcohol use		3 out of 4 surveys
Cannabis Use		3 out of 8 surveys
Daily or almost daily cannabis use		2 out of 8 surveys
Driving after cannabis use		3 out of 4 surveys
Illicit Drug Use		3 out of 8 surveys
Prescription Drug Abuse		1 out of 7 surveys

*None of the surveys indicated that students attending urban schools were more likely to report an outcome.



Discussion

The findings outlined in this report provide evidence at a cross-Canadian level that substance use and substance-use-related risk behaviours among Canadian students might vary by geographical setting. None of the eight studies involved in this report found urban students at increased likelihood of reporting any of the outcomes explored. Four other main findings emerged from the analysis:

1. Students attending rural schools had a greater likelihood of reporting alcohol use and consuming five or more drinks on a single occasion;
2. Students attending rural schools also had a greater likelihood of reporting drinking and driving, and cannabis use and driving;
3. Some surveys noted that rural students had a greater likelihood of reporting cannabis use, whereas others did not; and
4. There were no appreciable differences in the likelihood of reporting illicit drug use (other than cannabis) or prescription drug abuse among students attending school in urban or rural settings.

Results of these analyses are consistent with the findings of similar studies reviewed for this report (e.g., Centre for Addiction and Mental Health, 2012; Jiang, Li, Boyce, & Pickett, 2008).

Alcohol

Despite declining rates of substance use among adolescent students within Canada, youth continue to use alcohol at high rates, with two in every three youth aged 15 to 19 years old reporting consumption of alcohol in the past year (Statistics Canada, 2015). Moreover, 20% of youth drinkers exceeded the low-risk drinking guidelines for chronic health effects and 15% exceeded amounts linked to acute health risks (Statistics Canada, 2015; Canadian Centre on Substance Abuse, 2013).

The most consistent differences in urban-rural settings across the surveys were related to alcohol use. Depending on the survey, students who attended school in a rural setting were close to one and a half to three times more likely to report alcohol use in the past 12 months or 30 days. There was some indication that rural students were also more likely to report drinking five or more drinks on a single occasion with five out of eight surveys reporting this finding. Such results suggest that students attending schools in rural settings could be at a greater risk for harms associated with alcohol use.

High levels of alcohol consumption among adolescents is a serious issue as it has been associated with various negative consequences such as injuries (Swahn, Simon, Hammig, & Guerrero, 2004) and risky sexual behaviour (Fergusson & Lynskey, 1996), as well as brain abnormalities such as, smaller cerebellar volumes (Lisdahl, Thayer, Squeglia, McQueeney, & Tapert, 2013). Efforts focused on delaying, reducing or preventing alcohol use among students, especially those attending schools in rural settings, and education on the harms associated with drinking five or more drinks on a single occasion are essential.

Drinking and Driving

Among Canadian youth age 15 to 19 years old, approximately 16% reported driving after drinking alcohol in the past 30 days in 2012 (Jonah, 2013). One third of collisions resulting in fatalities are believed to be due to impaired driving. Many of these collisions involve youth (Traffic Injury Research Foundation of Canada, 2011). In 2010, close to half (47.2%) of all fatal crashes among Canadian youth aged 16 to 19 years involved alcohol (Traffic Injury Research Foundation of Canada, 2013). The current study found that reports of driving after consuming alcohol were more likely among students who attend schools in a rural setting compared with students in urban areas.



Cannabis Use

Cannabis remains the illicit substance most widely used among youth in Canada; with approximately 22% of youth ages 15 to 19 reporting past-year use (Statistics Canada, 2015). The findings in the current report do not suggest any consistent results that indicate urban or rural settings provide either risk or protective factors for cannabis use among students. This result was also the case for frequent cannabis use, with only two of the eight surveys indicating rural students were at increased likelihood of reporting daily or almost daily use.

Cannabis Use and Driving

Similar to driving after alcohol use, students in rural settings appear to be more likely to report driving after cannabis use. Identifying which youth might be more likely to engage in driving after cannabis use is meaningful as youth are often misguided about the safety of driving after use. One report found that students believed driving after cannabis to be the “safest way” to drive if under the influence (Barrie, Jones, & Wiese, 2011). Moreover, it has also been observed that youth often perceive the use of cannabis while driving to be safe, and some youth report that cannabis makes drivers more focused (Porath-Waller, Brown, Frigon & Clark, 2013).

Illicit Drug Use and Prescription Abuse

Findings were mixed and effects were infrequently observed with respect to illicit drug use other than cannabis, and this was also the case with the abuse of prescription drugs. One possible explanation for why youth in rural settings were more likely to report alcohol use and drinking five or more drinks on a single occasion, but not as consistently reported using other substances (e.g., cannabis, illicit and prescription drugs), might be the differing normative values of urban versus rural populations about underage drinking. While both urban and rural populations hold similar negative perceptions and stigma toward cannabis and other drug use by youth, there is often more acceptance of underage drinking in rural settings (Cronk & Sarvela, 1997; Alberta Alcohol and Drug Abuse Commission, 2005). As a result, high-risk behaviours associated with alcohol consumption might be more frequent in rural settings, although further research is needed to determine whether this link exists. Rural communities might also have differing attitudes toward drinking or cannabis use and driving because of the lack of public transit and taxis in rural areas. This differing attitudes might help explain the increased odds of rural students drinking or using cannabis and driving.

Implications

Outlining the differences in patterns of substance use between urban and rural settings is important as feelings of stigmatization, concerns around privacy when seeking treatment and a lack of confidence in treatments for alcohol use are more prevalent among at-risk drinkers who reside in rural areas (Fortney et al., 2004). Although not assessed in the current report, reluctance to access treatment and stigma might be important variables to examine in future research exploring differences in substance use patterns between urban and rural populations. Highlighting where substance use and risk behaviour disparities exist across urban-rural settings could help inform appropriate resource allocation and drug prevention strategies for communities at the greatest risk. As well, many other factors such as level of access to substances, which was not assessed in the current report, could also be accounting for urban-rural differences.



The findings from the current report, as well as further research examining the factors accounting for urban-rural student differences, could help inform the development of an evidence-based approach to addressing youth alcohol use and to associated risk behaviour prevention in rural settings. For instance, school boards might want to assess whether there is equity between the resources and services available to rural students compared to their urban counterparts. Further research could explore whether it is beneficial to provide additional or even specialized training for those responsible for youth drug prevention and services within rural school settings.

The level of access that youth in rural settings have to services and resources related to risky substance use should also be determined to ascertain if because of the geographical setting of these schools, alternative treatment and prevention methods of delivery might be more beneficial. Increased access to telephone or online services might be one potential avenue, if shown to be effective. Indeed, there has also been some suggestion that higher levels of substance use among rural youth could be due to limited drug education and treatment services because of the geographic location of some rural communities (Conger, 1997; DeVoe et al., 2009).

Other recommendations could include schools seeking partnership opportunities with community organizations to find ways to enhance extracurricular activities in an effort to ensure rural youth are provided with alternative avenues of recreation. Ultimately, this recommendation might require examining the infrastructure of rural communities to assess whether disparities exist between these communities and urban settings with respect to part-time job opportunities, sport, music, clubs and so on. If this is the case, finding ways to partner with organizations to bring more opportunities to youth in rural settings could be another preventative measure. Building capacity within communities to enhance protective factors (e.g., extracurricular activities) and limit risk factors (e.g., negative social influences) should always be considered in initiatives aimed at preventing youth substance use (Canadian Centre on Substance Abuse, 2010; United Nations Office on Drugs and Crimes, 2013).

Further examination of how students are travelling from parties, school and other events in an effort to assess what can be done to support easier access to safe transportation among rural youth might also be helpful to reduce the incidence of substance use and driving. Other factors such as mental health, social norms and education, which were not explored in the current report, might be influencing these differences in substance use. Finally, engaging youth in developing preventive approaches might provide the most effective way to initiate change. Indeed, the more youth are involved in health promotion initiatives, the more likely benefits will be realized for everyone in the community (Kahn, Lynn, Braga, Hoxworth, & Donovan, 2008). In line with this perspective, The Canadian Standards for Youth Substance Abuse Prevention advocates that youth partners be involved in prevention initiatives (Canadian Centre on Substance Abuse, 2010).

These suggestions are speculative, and further evidence is required to determine the effectiveness of these approaches in preventing or reducing substance use and associated risky behaviours among rural students. Importantly, while rural students appeared to be at a greater risk of reporting substance use and risk behaviours as compared to urban students, urban students continue to use substances and there remains a need to improve prevention efforts among all youth.

Limitations and Strengths

Several methodological limitations associated with this research should be noted. The surveys collected their data at various time points from 2007 to 2013, and so might not all be capturing recent urban-rural trends in student substance use. As well, variations in some of the outcome indicators could make comparisons across the surveys more difficult. Specifically, there were differences in the timeframe of assessments used for some of the outcomes (e.g., past 30-day use



of a substance vs. past 12-month). These variations have been noted where relevant and are summarized in Appendix B.

There were also differences across surveys in which variables were controlled for when conducting the multivariate logistic regression. British Columbia and Manitoba included age and sex in their models, but did not include socioeconomic status. In contrast, Quebec included age, sex and socioeconomic status as well as two additional variables: the weekly amount of money students reported having and self-reported school performance. Differences in sampling and methodology across the surveys preclude interprovincial comparisons. Some provinces and territories do not have student surveys that address drug use (Nunavut, Northwest Territories, Yukon and Saskatchewan) and some provinces that have student surveys did not contribute data for the current report (Ontario, Prince Edward Island).

Despite these limitations, there are a number of strengths to this work. For example, the surveys used were population based and the methodologies employed were robust. The use of multiple surveys allowed for an assessment of the level of consistency of findings across multiple sources of data. Rurality was defined by the school's location and while this definition could have allowed students who reside in urban or rural settings to be classified as the opposite if they attended a school in a different setting, it is also likely that this classification is the most useful method given that most student drug prevention and education programs are implemented at the school level. As well, the current report did not further delineate geographical settings that are encompassed within urban-rural regions. For instance, examining other subcategories within the urban-rural classification such as suburban or remote communities separately would be informative.

Future Research

An important extension of the current research would be to develop a better understanding of the underlying risk and protective factors, and pathways related to substance use among urban versus rural students. One potential factor that could influence differences in urban versus rural student substance use is boredom. It has been suggested that youth living in rural areas report a great level of boredom, which might be tied to greater consumption of alcohol (Kelly, Comello, & Edwards, 2004; Pettigrew, Miller-Day, Krieger, & Hecht, 2012). It would also be important to further explore the urban-rural differences in driving after alcohol and cannabis use to determine if the increased likelihood observed among rural youth is an artifact of greater time spent driving, possibly due to lack of access to public transit, or some other factor that might be contributing to such risk-taking behaviours. The current report also did not assess gender differences among urban and rural students and an important extension of the current findings would be to determine whether there were gender variations in substance use among students attending urban-rural schools. Future research could also investigate whether variations in perceived approval or disapproval exists for various substances and risk behaviours among urban and rural youth, as these beliefs might provide an indication of the underlying behavioural differences.

Conclusion

In sum, national and provincial data indicate that students who attend schools in rural settings are at increased likelihood of reporting certain outcomes related to substance use, predominantly those related to alcohol use and associated risk behaviours. Longitudinal data are needed to determine whether the differences in rural student substance use and risky behaviours observed in this report are linked to later health disparities in urban versus rural communities. These findings are an essential first step towards obtaining a cross-Canada picture of urban-rural student differences and point to key areas for which drug prevention strategies could be tailored for rural youth.



References

- Alberta Alcohol and Drug Abuse Commission. (2005). *Preventing heavy episodic drinking among youth and young adults: A literature review*. Edmonton, Alta: Author.
- Aronson, K. R., Feinberg, M. E., & Kozlowski, L. (2009). *Alcohol, tobacco, and other drug use among youth in rural Pennsylvania*. Harrisburg, PA: Center for Rural Pennsylvania.
- Barrie, L. R., Jones, S. C., & Wiese, E. (2011). "At least I'm not drink-driving": Formative research for a social marketing campaign to reduce drug-driving among young drivers. *Australasian Marketing Journal*, 19(1), 71-75.
- Boak, A., Hamilton, H.A., Adlaf, E.M., & Mann, R.E. (2013). Drug use among Ontario students, 1977–2013: Detailed OSDUHS findings (CAMH Research Document Series No. 36). Toronto, Ont.: Centre for Addiction and Mental Health.
- Canadian Centre on Substance Abuse (2013). *Canada's low-risk alcohol drinking guidelines* [brochure]. Ottawa, Ont: Author.
- Canadian Centre on Substance Abuse. (2010). *Stronger together: Canadian standards for community-based youth substance abuse prevention*. Ottawa, Ont.: Author.
- Canadian Institute for Health Information. (2013). *Hospital mental health services for concurrent mental illness and substance use disorders in Canada*. Toronto, Ont.: Author.
- Centre for Addiction and Mental Health. (2012). Rural vs. non-rural differences in drug-related risk behaviours among high school students. *CAMH Population Studies eBulletin*, 13(1).
- Coomber, K., Toumbourou, J. W., Miller, P., Staiger, P. K., Hemphill, S. A., & Catalano, R. F. (2011). Rural adolescent alcohol, tobacco, and illicit drug use: A comparison of students in Victoria, Australia, and Washington State, United States. *Journal of Rural Health*, 27(4), 409–415.
- Conger, R. D. (1997). The special nature of rural America. *NIDA Research Monograph*, 168, 37–52.
- Cronk, C. E., & Sarvela, P. D. (1997). Alcohol, tobacco, and other drug use among rural/small town and urban youth: A secondary analysis of the Monitoring the Future data set. *American Journal of Public Health*, 87(5), 760–764.
- Dew, B., Elifson, K., & Dozier, M. (2007). Social and environmental factors and their influence on drug use vulnerability and resiliency in rural populations. *Journal of Rural Health*, 23(s1), 16–21.
- DeVoe, J. E., Krois, L., & Stenger, R. (2009). Do children in rural areas still have different access to health care? Results from a statewide survey of Oregon's food stamp population. *Journal of Rural Health*, 25(1), 1–7.
- Fergusson, D. M., & Lynskey, M. T. (1996). Alcohol misuse and adolescent sexual behaviors and risk taking. *Pediatrics*, 98(1), 91-96.
- Fortney, J., Mukherjee, S., Curran, G., Fortney, S., Han, X., & Booth, B. M. (2004). Factors associated with perceived stigma for alcohol use and treatment among at-risk drinkers. *Journal of Behavioral Health Services & Research*, 31(4), 418–429.
- Gfroerer, J. C., Larson, S. L., & Colliver, J. D. (2007). Drug use patterns and trends in rural communities. *Journal of Rural Health*, 23(s1), 10–15.
- Gregoire, A. (2002). The mental health of farmers. *Occupational Medicine*, 52(8), 471–476.



- Hanson, C. L., Novilla, M. L. L., Barnes, M. D., Eggett, D., McKell, C., Reichman, P., & Havens, M. (2009). Using the rural-urban continuum to explore adolescent alcohol, tobacco, and other drug use in Montana. *Journal of Child & Adolescent Substance Abuse, 18*(1), 93–105.
- Iles, R. A., Davidson, M., Taylor, N. F., & O'Halloran, P. (2009). Systematic review of the ability of recovery expectations to predict outcomes in non-chronic non-specific low back pain. *Journal of Occupational Rehabilitation, 19*(1), 25–40.
- Jiang, X., Li, D., Boyce, W., & Pickett, W. (2008). Alcohol consumption and injury among Canadian adolescents: variations by urban-rural geographic status. *Journal of Rural Health, 24*(2), 143–147.
- Jonah, B. (2013). *CCMTA public opinion survey of drugs and driving in Canada: Summary Report*. Ottawa, Ont.: Canadian Council of Motor Transport Administrators.
- Johnston, L. D., O'Malley, P. M., Miech, R. A., Bachman, J. G., & Schulenberg, J. E. (2014). *Monitoring the Future national results on drug use: 1975–2013: Overview, key findings on adolescent drug use*. Ann Arbor, MI: Institute for Social Research, University of Michigan.
- Johnston, L. D., O'Malley, P. M., Miech, R. A., Bachman, J. G., & Schulenberg, J. E. (2015). *Monitoring the Future national survey results on drug use: 1975–2014: Overview, key findings on adolescent drug use*. Ann Arbor, MI: Institute for Social Research, University of Michigan.
- Kahn, R., Lynn, J., Braga, A., Hoxworth, T., & Donovan, K. (2008). *Engage youth! Colorado's guide to building effective adult-youth partnerships*. Denver, CO: Colorado Youth Partnership for Health, Colorado Department of Public Health and Environment.
- Kelly, K. J., Comello, M. L. G., & Edwards, R. W. (2004). Attitudes of rural middle-school youth toward alcohol, tobacco, drugs, and violence. *Rural Educator, 25*(3), 19–24.
- Lambert, D., Gale, J. A., & Hartley, D. (2008). Substance abuse by youth and young adults in rural America. *Journal of Rural Health, 24*(3), 221–228.
- Leadbeater, B. J., Foran, K., & Grove-White, A. (2008). How much can you drink before driving? The influence of riding with impaired adults and peers on the driving behaviors of urban and rural youth. *Addiction, 103*(4), 629–637.
- Lisdahl, K. M., Thayer, R., Squeglia, L. M., McQueeney, T. M., & Tapert, S. F. (2013). Recent binge drinking predicts smaller cerebellar volumes in adolescents. *Psychiatry Research: Neuroimaging, 211*(1), 17–23.
- National Center on Addiction and Substance Abuse. (2000). *No place to hide: Substance abuse in mid-size cities and rural America*. New York, NY: National Center on Addiction and Substance Abuse, Columbia University.
- Patterson, I., & Pegg, S. (1999). Nothing to do. The relationship between “leisure boredom” and alcohol and drug addiction: Is there a link to youth suicide in rural Australia? *Youth Studies Australia, 18*(2), 24–29.
- Paulozzi, L. J., & Xi, Y. (2008). Recent changes in drug poisoning mortality in the United States by urban-rural status and by drug type. *Pharmacoepidemiology and Drug Safety, 17*(10), 997–1005.
- Pettigrew, J., Miller-Day, M., Krieger, J., & Hecht, M. L. (2011). Alcohol and other drug resistance strategies employed by rural adolescents. *Journal of Applied Communication Research, 39*(2), 103–122.



- Pickett, W., Davison, C., Torunian, M., McFaull, S., Walsh, P., & Thompson, W. (2012). Drinking, substance use and the operation of motor vehicles by young adolescents in Canada. *PLoS One*, 7(8), e42807.
- Porath-Waller, A.J., Brown, J.E., Frigon, A.P., & Clark, H. (2013). *What Canadian youth think about cannabis*. Ottawa, Ont.: Canadian Centre on Substance Abuse.
- Poulin, C., Boudreau, B., & Asbridge, M. (2007). Adolescent passengers of drunk drivers: A multi-level exploration into the inequities of risk and safety. *Addiction*, 102(1), 51–61.
- Pruitt, L. R. (2009). The forgotten fifth: Rural youth and substance abuse. *Stanford Law & Policy Review*, 20, 259–404.
- Pulver, A., Davison, C., & Pickett, W. (2014). Recreational use of prescription medications among Canadian young people: Identifying disparities. *Canadian Journal of Public Health*, 105(2), e121–e126.
- Rhew, I. C., Hawkins, J. D., & Oesterle, S. (2011). Drug use and risk among youth in different rural contexts. *Health & Place*, 17(3), 775–783.
- Robertson, R., Vanlaar, W., Simpson, H., & Boase, P. (2009). Results from a national survey of Crown prosecutors and defense counsel on impaired driving in Canada: A “System Improvements” perspective. *Journal of Safety Research*, 40(1), 25–31.
- Sanne, B., Mykletun, A., Moen, B. E., Dahl, A. A., & Tell, G. S. (2004). Farmers are at risk for anxiety and depression: the Hordaland Health Study. *Occupational Medicine*, 54(2), 92–100.
- Statistics Canada. (2013). CMA and CA: Detailed definition. Retrieved from www.statcan.gc.ca/pub/92-195-x/2011001/geo/cma-rmr/def-eng.htm.
- Statistics Canada. (2015). *Canadian Tobacco, Alcohol and Drugs Survey: Summary of results for 2013*. Ottawa, Ont.: Author.
- Swahn, M. H., Simon, T. R., Hammig, B. J., & Guerrero, J. L. (2004). Alcohol-consumption behaviors and risk for physical fighting and injuries among adolescent drinkers. *Addictive Behaviors*, 29(5), 959–963.
- Traffic Injury Research Foundation of Canada. (2011). *The alcohol-crash problem in Canada: 2009*. Ottawa: Traffic Injury Research Foundation, CCMTA Road Safety Report Series.
- Traffic Injury Research Foundation of Canada. (2013). *The alcohol-crash problem in Canada: 2010*. Ottawa, Ont.: Canadian Council of Motor Transport Administrators and Transport Canada.
- United Nations Office on Drugs and Crime (2013). *The international drug control conventions*. New York, NY: Author.
- van Os, J., Kenis, G., & Rutten, B. P. (2010). The environment and schizophrenia. *Nature*, 468, 203–212.



Appendix A: Operational Definition of Rural

The group decided upon the rural and small town definition. The approach decided upon uses the Statistical Area Classification system, which was introduced by Statistics Canada in 2001 and covers all of Canada. The system groups Census Subdivisions (CSDs) according to whether they are in a Census Metropolitan Area (CMA), a Census Agglomeration (CA)³ or a census Metropolitan Influenced Zone (MIZ).

Each postal code can be linked to a CSD and these are coded as follows:

1. CSD in a CMA
2. CSD in a CA with at least one census tract⁴
3. CSD in a CA having no census tracts
4. CSD outside of a CMA or CA, and having strong metropolitan influence
5. CSD outside of a CMA or CA, and having moderate metropolitan influence
6. CSD outside of a CMA or CA, and having weak metropolitan influence
7. CSD outside of a CMA or CA, and having no metropolitan influence
8. CSD within the territories and outside of a CA

Schools in CSDs coded from 1 to 3 are classified as urban; schools in CSDs coded from 4 to 8 are classified as rural or small town.

³ Statistics Canada provides the following definitions: “A census metropolitan area (CMA) or a census agglomeration (CA) is formed by one or more adjacent municipalities centred on a population centre (known as the core). A CMA must have a total population of at least 100,000 of which 50,000 or more must live in the core. A CA must have a core population of at least 10,000. To be included in the CMA or CA, other adjacent municipalities must have a high degree of integration with the core, as measured by commuting flows derived from previous census place of work data” (Statistics Canada, 2013). The definitions are complicated and more information can be found at www.statcan.gc.ca/pub/92-195-x/2011001/geo/cma-rmr/def-eng.htm.

⁴ According to a Statistics Canada analyst: “Census tracts are a lower level of geography. They are one step up from Dissemination Areas, which are the lowest level of geography we release data for. They only exist in larger centres (population of 50,000 and up). Average census tract population is somewhere around 5,000. We work with local planners to create the boundaries for these so they better reflect local needs. In the City of Toronto they can be aggregated to neighbourhood boundaries, although that isn't a common linkage in other areas.”



Appendix B: Question Wording and Comparisons in Predictors Used in the Logistic Regression Analysis

Table 2: Question wording and comparisons in predictors used in logistic regression analysis

	National HBSC	National YSS	QC	BC	AB YSS	MB	NL	NB
Sex	Compared female to male	Compared female to male	Compared female to male	Compared female to male	Compared female to male	Compared female to male	Compared female to male	Compared female to male
Age or Grade	Compared youngest age category ≤14 to older students	Compared grade 7 to, 8, 9, 10, 11 and 12	Compared 1 st level of secondary to 2 nd , 3 rd , 4 th and 5 th	Included age as a continuous variable 12–19	Compared grade 7 to, 8, 9, 10, 11 and 12	Compared grade 7 to grades 8–12.	Compared grade 7 to grade 9, 10 and 12	Compared grade 7 to grade 9, 10 and 12
Socio-economic Status	Compared highest socioeconomic status to medium and low	Compared top 20% to bottom 20%	Compared to high to low	Not included in the model	Compared top 20% to bottom 20%	Not included in the model	Position on the “Canadian society ladder” Compared high to middle and low	Position on the “Canadian society ladder” Compared high to middle and low



Appendix C: Common Outcomes across the Surveys: Methods of Assessment

Table 3. Question wording and comparisons in outcomes used in prevalence estimates and logistic regression analysis

	National HBSC	National YSS	QC	BC	AB YSS	MB	NL	NB
Alcohol Use	<p>“On how many occasions in the last 12 months have you drank alcohol?”</p> <p>Compared 3 or more times vs. less than 3 times</p>	Past 12-months alcohol use	Alcohol use in the past 12 months	<p>“During the past 30 days, on how many days did you have at least one drink of alcohol?”</p> <p>Compared 0 days to one or more days</p>	Past 12-months alcohol use	12-months alcohol use Compared no to yes	<p>“In the past 12 months, how often did you drink alcohol-beer, wine, coolers, or hard liquor (rum, whisky, vodka, gin, etc.)?”</p> <p>Compared past-year alcohol use “once a month or less” and higher to “just a sip” or “never”</p>	<p>“In the past 12 months, how often did you drink alcohol-beer, wine, coolers, or hard liquor (rum, whisky, vodka, gin, etc.)?”</p> <p>Compared past-year alcohol use “once a month or less” and higher to “just a sip” or “never”</p>
Consumption of 5+ Drinks on One Occasion	<p>“In the past 12 months, how often have you had 5 or more drinks (4 or more for females) on one occasion?”</p> <p>Compared At least once a month vs. less than once a month</p>	Past 12-month excessive or binge drinking as defined by 5 or more drinks on one occasion	Past 12-month excessive binge drinking as defined by 5 or more drinks on at least one occasion	<p>“During the past 30 days, on how many days did you have 5 or more drinks of alcohol within a couple of hours?”</p> <p>Compared 0 days to 1 or more days</p>	Past 12-month excessive or binge drinking as defined by 5 or more drinks on one occasion	Past 12-month excessive or binge drinking as defined by 5 or more drinks on one occasion. Compared never to less than once a month and greater	<p>“In the past 30 days, how many times have you had five or more drinks of alcohol on the same occasion?”</p> <p>Compared consumption of 5+ drinks of alcohol on single occasion at least once in the past 30 days to no or did not drink alcohol in the past 30 days</p>	<p>“In the past 30 days, how many times have you had five or more drinks of alcohol on the same occasion?”</p> <p>Compared consumption of 5+ drinks of alcohol on single occasion at least once in the past 30 days to no or did not drink alcohol in the past 30 days</p>



	National HBSC	National YSS	QC	BC	AB YSS	MB	NL	NB
Driving after Alcohol Use	Not available	Not available	Not available	“Have you driven a car or other vehicle when you had been drinking alcohol?” Compared no to yes	Not available	Among students who drive: if they have ever driven within an hour of drinking. Compared never to 1–2 times or more	“In the past 12 months, how often have you driven a motor vehicle within an hour of drinking two or more drinks of alcohol?” Excluding students who did not drive or drink alcohol compared at least once in the past year to never.	“In the past 12 months, how often have you driven a motor vehicle within an hour of drinking two or more drinks of alcohol?” Excluding students who did not drive or drink alcohol compared at least once in the past year to never.
Cannabis Use	“Have you ever used or taken cannabis in the last 12 months?” Compared 3 or more times vs. less than 3 times	Past 12-months cannabis use	Past 12 months cannabis use	“During the past 30 days, on how many days did you use marijuana?” Compared 0 days to 1 or more days.	Past 12-months cannabis use	Past 12-month cannabis use. Compared no to yes	“In the past 12 months, how often did you use cannabis (marijuana, grass, weed, pot, hash, hash oil)?” Compared once or more to never used or does not know what cannabis is	“In the past 12 months, how often did you use cannabis (marijuana, grass, weed, pot, hash, hash oil)?” Compared once or more to never used, or did not use cannabis in the past 12 months, or does not know what cannabis is
Daily or Almost Daily Cannabis Use	“Have you ever used or taken cannabis in the last 30 days?” Compared 6 or more times vs. less than 6 times	Past 12-months daily or almost daily use	Past 12-months daily, almost daily or at least once or twice a week use among high school students	“During the past 30 days, used marijuana on 6 or more days?” Compared no to yes	Past 12-months daily or almost daily use	How often students had “smoked pot” in the past 30 days. Compared less than 3 times a week to almost	“In the past 30 days, how often did you use cannabis (marijuana, grass, weed, pot, hash, hash oil)?” Compared every	“In the past 30 days, how often did you use cannabis (marijuana, grass, weed, pot, hash, hash oil)?” Compared every



	National HBSC	National YSS	QC	BC	AB YSS	MB	NL	NB
						every day and above	day or almost every day to no or once a week or less	day or almost every day to no or once a week or less
Driving after Cannabis Use	Not available	Not available	Not available	“Have you driven a car or other vehicle when you had been using marijuana?” Compared no to yes	Not available	Among students who drive if they had driven after using pot Compared never to once or more	“In the past 12 months, how many times have you driven a motor vehicle within an hour of using cannabis?” Excluding students who did not drive or use cannabis compared at least once in the past year to never	“In the past 12 months, how many times have you driven a motor vehicle within an hour of using cannabis?” Excluding students who did not drive or use cannabis compared at least once in the past year to never
Illicit Drug Use	Comparison conducted on Illicit drugs was ever vs never use. Illicit drugs included ecstasy, MDMA, amphetamines, opiates, cocaine, glue or solvents, LSD and other hallucinogens, methamphetamines, salvia	Past 12-months illicit drug use Illicit drugs included amphetamines (speed, ice, meth); MDMA (ecstasy, E, X); hallucinogens (LSD or acid, PCP, magic mushrooms, mesc); salvia (Divine Sage, Magic Mint, Sally D); heroin (smack, H, junk, crank); cocaine (coke, crack, blow, snow)	Past 12 months use of other drugs, excluding cannabis or non-prescription medications	Comparison conducted on Illicit drugs was ever vs never use. Illicit drugs included: cocaine, hallucinogens, ecstasy, MDMA, mushrooms, inhalants, amphetamines, crystal meth, heroin, ketamine, and steroids	Past 12-months illicit drug use Illicit drugs included amphetamines (speed, ice, meth); MDMA (ecstasy, E, X); hallucinogens (LSD or acid, PCP, magic mushrooms, mesc); salvia (Divine Sage, Magic Mint, Sally D); heroin (smack, H, junk, crank); cocaine (coke, crack, blow, snow)	Past 12-months illicit drug use Illicit drugs included mushrooms, cocaine, crack, ecstasy, hallucinogens, over the counter drugs to get high, hallucinogens, methamphetamines, inhalants, aerosol, heroin, opioids, and salvia	Past 12-months illicit drug use Illicit drugs included cocaine or crack cocaine, LSD, psilocybin or mescaline, methamphetamine (crystal meth, speed, crank, chalk, ice), MDMA (ecstasy), mephedrone (drone, bubbles, m-cat), inhalants (solvents and glue) and salvia divinorum Compared yes to no	Past 12-months illicit drug use. Illicit drugs included cocaine or crack cocaine, LSD, psilocybin or mescaline, methamphetamine (crystal meth, speed, crank, chalk, ice), MDMA (ecstasy), mephedrone (drone, bubbles, m-cat). Compared yes to no



	National HBSC	National YSS	QC	BC	AB YSS	MB	NL	NB
Prescription Drug Abuse	Medication to get high, taken in the last 12 months; pain relievers, stimulants, sedatives-tranquilizers Compared never use vs ever	Past 12-months psychoactive pharmaceutical used to get high Psychoactive pharmaceutical drugs used to get high include tranquilizers or sedatives (tranqs, downers); stimulants (uppers, bennies) or ADHD treatment; pain relievers (such as Percocet, Percodan, Demerol, OxyContin or any pain reliever with codeine)	Not available	“During your life, have you used prescription pills without a doctor’s consent?” Comparison conducted on ever vs. never use	Past 12-months psychoactive pharmaceutical used to get high Psychoactive pharmaceutical drugs used to get high include tranquilizers or sedatives (tranqs, downers); stimulants (uppers, bennies) or ADHD treatment; pain relievers (such as Percocet, Percodan, Demerol, OxyContin or any pain reliever with codeine)	Past 12-months prescription drug use Prescription drugs included using their own prescription to get high or someone else’s, and use of Ritalin to get high	Past 12-months use of drug without a prescription or a doctor’s supervision Prescription drugs included stimulants (diet pills, stay awake pills), pain relief pills/opiates (Percocet, Percodan, Tylenol #3, Demerol, Oxycontin, codeine) and tranquilizers-sedatives Compared yes to no	Past 12-months use of drug without a prescription or a doctor’s supervision. Prescription drugs included stimulants (diet pills, stay awake pills), pain relief pills/opiates (Percocet, Percodan, Tylenol #3, Demerol, Oxycontin, codeine) and tranquilizers-sedatives Compared yes to no



Appendix D: Survey Design Variables of Contributing Surveys

Table 4. Additional Information on methods used across surveys

	National	National	QC	BC	AB YSS	MB	NL	NB
Name of Survey	Health Behaviour in School-aged Children (HBSC)	Youth Smoking Survey	Quebec Survey of Smoking, Alcohol, Drugs, and Gambling in High School Students	Adolescent Health Survey	Youth Smoking Survey	Alcohol and other Drugs: Students in Manitoba	Student Drug Use Survey in the Atlantic Provinces	Student Drug Use Survey in the Atlantic Provinces
Date of Data Collection	2010	2012–2013	Nov. to Dec. 2013	2013	2012–2013	2007	May and June, 2012	May and June, 2012
Sample Size	26,078 from 436 Schools	47,203	4,943 students in 153 Schools	29,832	5,743	4,992 students in 55 schools	2,530 students in 72 schools	3,465 students in 110 schools
Clusters	Two-stage (school and class) cluster sampling	Two-stage (school and class) cluster sampling	Two-stage (school and class) cluster sampling	Classes	Two-stage (school and class) cluster sampling	Classes	Two-stage (school and class) cluster sampling	Two-stage (school and class) cluster sampling
Link to Report	http://www.phac-aspc.gc.ca/hpps/dca-dea/publication-s/hbsc-mental-mentale/assets/pdf/hbsc-mental-mentale-eng.pdf	http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/recherche-recherche/stat/_survey-sondage_2012-2013/table-eng.php	http://www.stat.gouv.qc.ca/statistiques/sante/enfants-ados/alcool-tabac-drogue-jeu/tabac-alcool-drogue-jeu-2013.pdf	http://www.mcs.bc.ca/pdf/From_Hastings_Street_To_Haida_Gwaii.pdf	https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/sites/ca.canadian-student-tobacco-alcohol-drugs-survey/files/uploads/files/yss12_ab_provincial_profile_final_en_20150304.pdf	http://afm.mb.ca/wp-content/uploads/woocommerce_uploads/2013/10/2007-Manitoba-School-Student-Survey-Nov08.pdf	Newfoundland Report: http://www.health.gov.nl.ca/health/publications/Drug_Survey.pdf	New Brunswick Report: http://www.gnb.ca/0378/pdf/2013/9230e.pdf



Appendix E: Odds Ratios with 95% Confidence Intervals for Bivariate and Multivariate Models

Table 5. Bivariate (Grey) and multivariate (black) odds ratios with 95% confidence intervals for the common model when assessing urban-rural differences in substance use

	HBSC	YSS	QC	BC	AB (YSS)	MB	NL	NB
Alcohol Use⁵	1.43 (1.13-1.82)*	2.44 (1.92-3.09)*	1.33 (0.90-1.96)		3.35 (2.18-5.14)*	1.39 (1.16-1.65)*	1.1 (0.7-1.7)	1.21 (0.80, 1.82)
	1.44 (1.13-1.84)*	2.95 (1.80-4.10)*	1.71 (1.28-2.29)*	2.01 (1.83-2.22)*	2.71 (1.69-3.73)*	1.45 (1.20-1.74)*	1.6 (1.1-2.2)*	1.02 (0.81-1.30)
Consumption of 5+ Drinks on a Single Occasion	1.67 (1.24-2.25)*	2.30 (1.85-2.86)*	1.09 (0.74-1.60)		3.30 (2.18-5.01)*	1.68 (1.44-1.95)*	0.9 (0.6-1.5)	1.17 (0.74, 1.85)
	1.68 (1.25-2.27)*	2.60 (1.69-3.50)*	1.23 (0.85-1.76)	1.88 (1.67-2.12)*	2.49 (1.80-3.18)*	1.73 (1.48-2.03)*	1.2 (0.9-1.7)	1.08 (0.72-1.62)
Drinking and Driving	Data not available	Data not available	Data not available		Data not available	1.93 (1.53-2.43)*	1.9 (1.0-3.4)*	1.29 (0.80-1.92)
				2.12 (1.77-2.68)*		1.93 (1.53-2.43)*	2.0 (1.1-3.5)*	1.29 (0.86-1.96)
Cannabis Use⁵	1.08 (0.79-1.48)	1.58 (1.24-2.00)*	0.92 (0.64-1.32)		1.69 (1.12-2.54)*	1.09 (0.95-1.26)	0.7 (0.5-1.1)	0.88 (0.66-1.81)
	1.08 (0.79-1.49)	1.58 (1.20-1.96)*	1.00 (0.72-1.40)	1.71 (1.52-1.92)*	1.48 (1.06-1.89)*	1.09 (0.95-1.27)	0.8 (0.6-1.1)	0.77 (0.56-1.04)
Daily or almost Daily Cannabis Use	1.18 (0.80-1.75)	1.50 (1.10-2.04)*	0.79 (0.49-1.28)		1.86 (0.99-3.51)	1.74 (1.30-2.34)*	0.6 (0.3-1.1)	0.73 (0.42-1.27)
	1.19 (0.80-1.76)	1.28 (0.88-1.68)	0.86 (0.55-1.34)	1.76 (1.51-2.06)*	1.56 (0.80-2.31)	1.77 (1.31-2.38)*	0.7 (0.3-1.3)	0.59 (0.35-1.02)
Driving after Cannabis Use	Data not available	Data not available	Data not available		Data not available	1.89 (1.44-2.48)*	0.9 (0.5-1.6)	1.39 (0.97-1.98)
				1.75 (1.46-2.11)*		1.93 (1.47-2.54)*	1.0 (0.7-1.6)	1.42 (1.05-1.92)*

⁵ All surveys assessed past-year use, with the exception of British Columbia, which assessed past-month use.



	HBSC	YSS	QC	BC	AB (YSS)	MB	NL	NB
Illicit Drug Use⁶	0.83 (0.58-1.20)	1.84 (1.35-2.50)*	0.73 (0.46-1.16)		1.80 (1.07-3.02)*	1.03 (0.82-1.31)	1.0 (0.6-1.5)	0.88 (0.61-1.28)
	0.83 (0.58-1.20)	1.84 (1.18-2.49)*	0.81 (0.54-1.21)	1.53 (1.35-1.74)*	1.84 (1.17-2.50)*	1.03 (0.81-1.31)	1.1 (0.7-1.6)	0.77 (0.55-1.08)
Prescription Drug Abuse⁶	1.02 (0.72-1.45)	1.41 (1.05-1.89)*	Data not available		1.56 (0.98-2.48)	1.04 (0.81-1.33)	1.1 (0.8-1.5)	1.30 (0.98-1.72)
	1.02 (0.72-1.47)	1.42 (1.06-1.78)*		0.98 (0.87-1.10)	1.45 (0.65-2.24)	1.05 (0.82-1.34)	1.1 (0.8-1.6)	1.19 (0.88-1.62)

Bivariate values are represented in grey and multivariate values in black. Multivariate results represent values when taking into account age (or grade level), sex and socioeconomic status. Quebec also accounted for the weekly amount of money students reported having, as well as participants' self-reported school performance.

*Indicates a significant odds ratio for urban-rural environment and the outcome (referent group=urban).

⁶ British Columbia assessed lifetime use.