Abstract:

Background: Consequences of impaired driving disproportionately affect youth. Increasing rates of driving after using marijuana are especially concerning. This study describes individual- and area-level predictors of risky driving and passenger behaviours among grades 9-12 students in Canada.

Methods: The 2014/2015 Canadian Student Tobacco, Alcohol and Drug Survey was administered to 24,650 students in provincially generalizable samples. Dichotomous outcomes included: ever and last-30-day driving after (a) drinking alcohol and (b) using marijuana; and ever and last-30-day reporting of being a passenger with a driver who had been (c) drinking or (d) using marijuana.

Results: 7% of grade 9-12 students reported ever driving after drinking and 7% reported driving after using marijuana. In total, 41% reported ever participating in any risky driving or passenger behaviour. Over one-third (35%) reported ever riding with a driver who had been drinking and 20% reported ever riding with a driver who had been using marijuana. Logistic regression models demonstrated that males had higher odds of risky driving behaviours relative to females, whereas females had higher odds of risky passenger behaviours relative to males. Students from rural schools had higher odds of drinking and driving, and of riding with a drinking driver relative to students from urban schools. There were also significant differences in risky driving and passenger behaviours by province.

Interpretation: A substantial number of Canadian youth report risky driving and passenger behaviours. Federal marijuana policy should aim to reduce the prevalence of alcohol and other drug-impaired driving. Additional provincial impaired driving prevention policies are needed.

WORD COUNT: 250

Introduction:

Accidents are the leading cause of death among Canadian 1-24 year olds, responsible for 35% of deaths among this age group.[1-3] Despite significant declines over the past three decades, traffic collisions comprise a bulk of accident-related mortality and injury, and place a significant burden on the health care system through emergency medical services, rehabilitation, and chronic care.[4] Young drivers are at higher risk of being killed in motor vehicle collisions than any other age group,[5] and 39% of car-crash deaths among 16-19 year olds were related to alcohol use in 2012.[6] Alcohol is the most commonly-used intoxicant in Canada,[7] and the link between alcohol-impaired driving and high accident involvement rates has been demonstrated consistently over time.[8,9]

Programs and policies to reduce the prevalence of alcohol-impaired driving have been established.[10,11] Less-frequently studied is adolescents' decisions to ride as passengers with impaired drivers. Using data from the 2008 Canadian Alcohol and Drug Use Monitoring Survey (CADUMS), one study found that 15% of 15-17 year olds reported riding with a driver under the influence of alcohol and 19% reported riding with a driver under the influence of cannabis.[12] Another, using 2009/2010 data from the Health Behaviour in School-Aged Children (HBSC) survey found that about 20% of grades 6-10 students reported riding with a driver who had consumed alcohol, cannabis or other illicit drugs in the past 30 days.[13] Younger age (9-15), male gender, heavy drinking, lower socio-economic status (SES), and rural residence are associated with riding with an impaired driver.[12-15]

Effects of cannabis consumption on driving is less frequently studied than the effect of alcohol consumption on driving. Cannabis is second only to alcohol as the most commonly used intoxicant in Canada.[7] Among Canadian youth, 19% reported cannabis use.[16] Cannabis-impaired driving has recently come to the fore given the Canadian government's plan to legalize the possession and sale of marijuana to adults. Proposed legislation to reduce drug-impaired driving was tabled in October 2016 in the Canadian senate,[17] and in the absence of current federal law, Canadian provinces have begun to

introduce new legislation to enact broader measures to address drug-impaired driving and to create heavier sanctions.[18]

Cannabis use compromises reaction time, concentration, visual acuity, short-term memory, and one's ability to handle unexpected events, but debate within the scientific community exists regarding the extent to which driving under the influence of cannabis causes motor vehicle fatalities.[19-23] It is generally accepted that driving under the influence of cannabis doubles drivers' risk of collision,[21] which is important given that almost twice as many Ontario students report driving after consuming cannabis than after consuming alcohol.[24] In Ontario in 2015, 12% of grades 7-12 students rode with a driver who had been using drugs at least once in the past year.[24]

In light of the impending legalization of cannabis in Canada and related concerns about safe driving and passenger practices, particularly among youth, this study describes individual- and area-level predictors of risky driving and passenger behaviours among grades 9-12 students in Canada. We also report inter-provincial differences, since driving age and alcohol policies vary by province. Forthcoming drug-impaired driving policies may also vary by province.

Methods:

Study design

The Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) is a biennial, provincially-generalizable, paper-and-pencil, school-based survey administered to students across Canada (see https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/). The target population for 2014/2015 CSTADS was grades 6-12 students (6 to secondary V in the province of Quebec) attending private, public, and Catholic schools in all 10 provinces. The 2014/2015 CSTADS did not include a generalizable sample of students in the province of New Brunswick due to a low response rate. National estimates, however, do include data from the three New Brunswick schools that participated. The

survey design was a stratified single stage cluster design; strata were based on health region smoking rate and type of school. In each province, two or three health region smoking rate strata and two school-level strata (elementary and high school) were defined. Schools were randomly selected within each stratum to ensure a generalizable sample within a province.

A total of 177 school boards (68% recruitment rate), 336 schools (47% recruitment rate), and 42,094 students (66% recruitment rate) participated in the CSTADS (24,650 were in Grades 9-12); sample size was based on the ability of the sample to provide generalizable estimates at the provincial level. This study uses data from grades 9-12 students since the overwhelming majority of students in grades 7-8 are not old enough to operate motor vehicles in any province. Data were collected between October 2014 and May 2015.

The study received ethics approval from the Health Canada Research Ethics Board, the Office of Research Ethics at the University of Waterloo, and from ethics review boards located at institutions and school boards in each province.

Measures

Dichotomous outcomes from the 2014/2015 CSTADS include: ever and last-30-day experiences of 1) driving within 1 hour of drinking alcohol; 2) driving within 2 hours of using marijuana; 3) being a passenger in a vehicle driven by someone who consumed alcohol within the last hour; and 4) being a passenger in a vehicle driven by someone who had used marijuana in the last 2 hours. The first two outcomes were derived from survey responses to the question, “Have you driven a vehicle (e.g., car, snowmobile, motor boat, or all-terrain vehicle (ATV))…” a) within an hour of drinking one or more drinks of alcohol? and b) within 2 hours of using marijuana? Response options included “No, never”, “Yes, in the last 30 days”, “Yes, more than 30 days ago”. Outcomes three and four were derived from survey responses to the question, “Have you ever been a passenger in a vehicle (e.g., car, snowmobile, motor

boat, or all-terrain vehicle (ATV))…" a) driven by someone who had one or more drinks of alcohol in the last hour? and b) driven by someone who had been using marijuana in the last 2 hours?, with the same response options as above. For all four outcomes of interest, dichotomous variables were created to assess "Ever" (those who responded with either of the "yes" options) and "Last 30 day" (those who responded "Yes, in the last 30 days") driving and passenger behaviours.

Independent variables included respondents': sex (female, male); grade (9-12) (ages 13-17 in Canada); province of residence (with Ontario as the reference province given that it is the most populous province in Canada); binge drinking among students who reported consuming alcohol (never drinkers, students who reported ever drinking but never binge-drinking, and binge-drinkers: students who reported ever drinking at least five drinks on one occasion); and race/ethnicity (White, Black, Asian, Aboriginal, Latin American, or "other").

Two area-level independent variables were also examined: school-region socio-economic status (SES) and rural vs. urban school location. Median family income of the school's forward sortation area (first three digits of the postal code) from the 2011 census was dichotomized at the national median and treated as a dichotomous variable (High SES and Low SES). Urban and rural categories were based on Statistics Canada's Statistical Area Classification system and derived from school postal codes. Urban areas were considered census metropolitan areas (CMA) or census agglomerations (CA), which are areas consisting of at least one neighbouring municipality situated around a core. CMAs have a total population of at least 100,000 of which 50,000 must live in the core; CAs must have a core population of at least 10,000.[25] Rural areas were considered non- census metropolitan areas or census agglomerations. These definitions of SES and urban vs. rural locale were adopted since these are the variables contained in the CSTADS public use microdata file.[26]

Statistical Analysis

Survey weights were used to adjust for sampling methods, non-response (school, class, and student levels), and calibration of the sample to the grade and sex distribution of the target population. Bootstrap weights were used for all analyses to account for survey design in the variances.

Descriptive statistics were used to show weighted prevalence of driving and passenger outcomes of interest according to the independent variables listed above. Logistic regression models were created to examine independent variables associated with ever and last-30-day: 1) driving after drinking; 2) driving after using marijuana; 3) riding with a driver who drank, and; 4) riding with a driver used marijuana. Covariates for each model included respondents' sex, grade, ethnicity, drinking behaviours, school-level SES, and school-level urban vs. rural locale. Logistic regression analyses were conducted using PROC SURVEYLOGISTIC in SAS 9.4 (SAS Institute Inc, Cary, North Carolina).

Results:

Table 1 presents sample characteristics. Overall, 7.1% of Canadian grades 9-12 students reported ever driving within an hour of drinking at least one drink (see Table 2). A similar proportion (6.6%) reported ever driving within two hours of using marijuana (see Table 3). A much greater proportion reported being passengers of drinking drivers (34.6%) (see Table 4) or marijuana-using drivers (19.8%) (see Table 5). Ever driving after drinking ranged from a low of 5.0% in Ontario to a high of 14.1% in Saskatchewan. Ever driving after using marijuana ranged from a low of 5.0% in Quebec and Ontario to 14.0% in Saskatchewan. In the overall sample, 41.2% (representing 622,300 grades 9-12 students) reported ever engaging in any risky driving or passenger behaviours: 24.7% (representing 372,300 grades 9-12 students) reported engaging in one behaviour and 16.6% (representing 250,000) reported engaging in more than one behaviour.

Females had lower odds than males of ever driving after drinking and of doing so in the last 30 days. Conversely, compared to males, females had higher odds of riding with a driver who had drank at least one alcoholic beverage in the hour before.

Grade 12 students had higher odds of reporting risky driving and passenger behaviours than grade 9 students (see Tables 2-5). Drinking and driving did not vary by ethnicity. Relative to those identifying as white, students identifying as Aboriginal had higher odds of driving after marijuana use and of being a passenger of a marijuana-using driver. Students identifying as Black had higher odds of last-30-day driving after using marijuana and students identifying as Latin American had higher odds of ever driving after using marijuana relative to students identifying as White. In contrast, compared to those identifying as white, students who identified as Asian had lower odds of riding as passengers of a marijuana-using driver. Students who reported binge drinking had higher odds of drinking and driving compared to students who reported never drinking.

Few differences by school region SES were observed, with the exception that students from high SES schools had lower odds of reporting riding with a drinking driver. Relative to urban students, students from rural schools had higher odds of reporting driving after drinking and of reporting riding with a drinking driver.

Interpretation:

In Canada in 2014/2015, 7% of grades 9-12 students reported ever driving within an hour of drinking alcohol or within 2 hours of using marijuana. A full 41%, representing 798,200 grades 9-12 students in Canada, reported ever engaging in at least one risky driving or passenger behaviour. We found significant differences in unsafe driving and passenger behaviours by individual characteristics such as gender, grade, and binge drinking behaviours. Few differences in unsafe driving or passenger

behaviours existed by area-level factors such as school-level SES and urban vs. rural locale. Main findings are described in more detail below.

First, in our study, 10% of students reported ever driving after using alcohol or marijuana. Just over one-third (35%) of students reported being passengers of a drinking driver, and 20% reported being passengers of a marijuana-using driver. HBSC data from 2010 found 10% of Canadian 11-15 year olds reported drinking and driving off-road or on-road vehicles in the last 30 days.[13] In 2015, 5% of Ontario grades 10-12 students with a driver's licence reported driving after drinking and 10% reported driving after cannabis use.[24] In terms of passenger behaviours, 2008 CADUMS data showed that 14.6% of 15-17 year olds rode as a passenger of a drinking driver and 19.3% rode as a passenger of a marijuana-using driver,[12] while 2010 HSBC data showed that 21% of 11-15 year olds reported riding with a driver who had been using alcohol, marijuana or other illegal drugs in the last 30 days.[13] In 2015 in Ontario, 15% of grades 7-12 students rode with a drinking driver whereas 12% rode with a drug-using driver in the past year.[24] These differences are likely a function of survey methods, populations (e.g., the Ontario study examined driving behaviours among grades 10-12 students with a drivers' licence whereas we examined the entire sample of grades 9-12 students in Canada), or instruments (e.g., the CADUMS survey asked about past 12 month behaviour while CSTADS asked about "last 30 day" and "ever" behaviour).

Second, we found that while boys had higher odds of *driving* after drinking or using marijuana, girls had higher odds of *riding* with drivers who had been drinking or using marijuana. Males typically have higher odds of driving while impaired.[27-29] Findings around the gendered nature of risky *passenger* behaviours are inconsistent, with some studies finding males more likely to be passengers of impaired drivers,[12,28,29] others finding females at higher risk,[30] and still others finding no difference.[27] Consistent with past research, we found that older adolescents[28-30] and those who reported binge drinking[12,27,30] had higher odds of driving after drinking and riding with potentially impaired drivers.

We found few differences by school-region SES, but compared to urban students, rural students had higher odds of reporting both driving after drinking and being a passenger in a vehicle with a driver who had been drinking, consistent with previous research.[28-30] Importantly, this was the first study to find inter-provincial differences in risky driving and passenger behaviours. While there were few significant differences in driving and passenger behaviours after alcohol consumption, students from the three East Coast provinces for which provincially generalizable data were available (NL, PEI, and NS) had significantly higher odds of driving and being a passenger after marijuana consumption relative to Ontario students. This is important because irrespective of the forthcoming federal approach to legalizing and regulating cannabis, it is within provincial jurisdiction to enact stricter provincial policies to reduce cannabis-impaired driving.

The current study is subject to several limitations. First, survey items asked about driving within an hour of consuming one or more drinks of alcohol or within two hours of using marijuana. While cognitive interviewing showed these questions were easy to answer for the target population, they do not assess level of impairment, which depend on driver characteristics and on the amount of alcohol or marijuana consumed. Second, CSTADS did not include participants from Canada's territories where the prevalence of impaired driving is high.[31] However, non-included populations represent only a small fraction of the Canadian population. Third, given that CSTADS is focused on tobacco, alcohol and drug use and not driving behaviours per se, we were unable to account for whether students had driver's licences.[30] Our prevalence estimates of risky driving behaviours would likely have been higher had we examined driving behaviours among licenced youth. Fourth, data presented here represent self-reported responses. While efforts are made each cycle to establish the validity and reliability of questionnaire items,[32] some under-reporting is likely. For example, youth might be more willing to admit to being a passenger of a substance-using driver than they would be willing to admit they broke the law by using a substance before driving. Distinguishing between alcohol use and marijuana use before

driving is a strength of the current study, particularly in light of impending marijuana legalization in Canada. In addition, the comprehensive measures we used included risky driving of all types. The national scope of the data and provincially-generalizable estimates are also study strengths.

Driving under the influence remains a problem in Canada. Impending legalization of marijuana requires further interventions to reduce impaired driving.[33-35] Innovative provincial policies can be implemented in the absence of federal legislation to reduce impaired driving.

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Table 1: Sample characteristics, grades 9-12 students: 2014/2015 CSTADS

	Sample size (n)	Weighted % (99% CI)
Canada (total)	24,650	
Sex		
Female	12,514	48.6 (48.6, 48.6)
Male	12,100	51.4 (51.4, 51.5)
Grade		
9	7,200	25.2 (25.2, 25.2)
10	6,986	25.3 (25.2, 25.3)
11	6,193	25.5 (25.5, 25.5)
12	4,271	24.0 (24.0, 24.1)
Ethnicity		
White	16,970	60.9 (52.3, 69.4)
Black	859	4.7 (3.0, 6.3)
Asian	3,597	22.7 (14.6, 30.9)
Latin American	434	2.3 (1.2, 3.3)
Aboriginal	1,684	4.7 (3.0, 6.3)
Other	955	4.8 (3.5, 6.0)
Provinces		
NL	2,458	1.4 (1.3, 1.4)
PE	1,446	0.5 (0.5, 0.5)
NS	2,778	2.7 (2.6, 2.7)
QC	2,608	15.9 (15.5, 16.3)
ON	3,657	46.3 (45.1, 47.6)
MB	1,863	4.0 (3.9, 4.1)
SK	1,895	3.2 (3.1, 3.3)
AB	3,957	10.8 (10.5, 11.1)
BC	3,862	12.9 (12.6, 13.3)
School SES		
Low Median	12,066	44.9 (28.6, 61.1)
High Median	12,584	55.1 (38.9, 71.4)
Urban		
Yes	15,801	79.5 (68.1, 90.9)
No	8,849	20.5 (9.1, 31.9)*
Ever Binge Drink		
Don't Drink	8,881	38.8 (34.4, 43.2)
Drink but no binge	4,052	18.1 (16.2, 20.1)
Binge	10,955	43.1 (39.6, 46.5)

Table 2. Weighted prevalence and logistic regression analysis[a] of variables related to the odds of driving within an hour of drinking at least one drink among Canadian grades 9-12 students: 2014/2015 CSTADS

	Last 30 days (n=22,861)	OR (99% CI)	p value	Ever (n=22,861)	OR (99% CI)	p value
Canada (total)	2.7 (2.2-3.1)			7.1 (6.3-8.0)		
Sex						
Female	1.8 (1.4-2.2)	0.456 (0.290, 0.717)	<0.0001	5.0 (4.0-6.0)	0.461 (0.333, 0.638)	<0.0001
Male	3.5 (2.8-4.2)	Ref		9.1 (7.8-10.4)		
Grade						
9	1.6 (1.1–2.1)	Ref		4.2 (3.4-4.9)	Ref	
10	2.1 (1.5–2.6)	0.960 (0.461, 1.999)	0.8845	6.0 (4.8-7.1)	1.043 (0.714, 1.523)	0.7754
11	2.9 (2.2–3.6)	1.235 (0.513,2.971)	0.5343	7.1 (6.1-8.1)	1.138 (0.792, 1.635)	0.3562
12	4.2 (3.2–5. 1)	1.579 (0.774, 3.221)	0.0980	11.3 (9.2-13.4)	1.769 (1.185, 2.642)	0.0003
Ethnicity						
White	2.9 (2.2-3.5)	Ref		8.2 (6.9-9.5)	Ref	
Black	#	2.070 (0.777, 5.516)	0.0555	5.7 (2.8-8.6)*	1.217 (0.618, 2.397)	0.4542
Asian	1.1 (0.6-1.7)*	0.932 (0.443, 1.959)	0.8060	3.0 (2.1-3.9)	0.819 (0.471, 1.423)	0.3501
Latin American	#	4.154 (0.676, 25.518)	0.0430	11.5 (5.9-17.2)*	2.336 (0.789, 6.915)	0.0438
Aboriginal	5.2 (3.1-7.3)*	1.695 (0.696, 4.131)	0.1261	13.1 (9.2-17.1)	1.271 (0.666, 2.424)	0.3384
Other	2.9 (1.1-4.7)*	1.956 (0.694, 5.513)	0.0946	6.1 (3.3-9.0)*	1.353 (0.526, 3.483)	0.4089
Provinces						
NL	4.0 (3.2-4.8)	1.548 (0.830, 2.888)	0.0705	10.7 (7.1-14.4)*	1.737 (1.095, 2.755)	0.0021
PE	3.7 (2.8-4.5)	1.275 (0.673, 2.416)	0.3251	9.2 (7.0-11.5)	1.346 (0.831, 2.181)	0.1115
NS	3.1 (2.1-4.0)	1.036 (0.553, 1.942)	0.8848	7.3 (5.8-8.8)	1.099 (0.739, 1.635)	0.5394
QC	2.3 (1.1-3.6)*	0.783 (0.385, 1.594)	0.3747	7.0 (5.5-8.4)	1.017 (0.684, 1.512)	0.9125
ON	1.9 (1.3-2.5)	Ref		5.0 (3.7-6.4)	Ref	
MB	2.6 (1.6-3.5)*	0.806 (0.362, 1.798)	0.4878	8.8 (5.0-12.5)*	1.297 (0.609, 2.762)	0.3736
SK	6.6 (3.3-10.0)*	2.639 (1.360, 5.122)	0.0002	14.1 (8.2-20.1)*	2.436 (1.364, 4.349)	<0.0001
AB	2.5 (1.8-3.2)	1.172 (0.643, 2.137)	0.4943	6.9 (5.4-8.4)	1.408 (0.950, 2.087)	0.0252
BC	3.3 (2.3-4.2)	1.326 (0.699, 2.518)	0.2552	9.0 (7.0-11.1)	1.653 (0.950, 2.875)	0.0193
School SES						
Low Median	2.9 (2.2-3.5)	Ref		8.5 (6.8-10.2)	Ref	
High Median	2.5 (1.9-3.1)	1.214 (0.728, 2.024)	0.3283	6.0 (5.0-7.0)	0.899 (0.602, 1.344)	0.4944
Urban						
Yes	2.0 (1.6-2.4)	Ref		5.4 (4.5-6.2)	Ref	
No	5.4 (4.3-6.4)	2.058 (1.341, 3.160)	<0.0001	13.6 (11.4-15.9)	1.719 (1.287, 2.297)	<0.0001
Drinking behaviour						
Don't Drink	#	Ref		0.9 (0.4-1.3)*	Ref	
Drink (no binge)	0.7 (0.4-1.0)*	1.446 (0.412, 5.076)	0.4477	2.4 (1.6-3.1)	2.569 (1.042, 6.333)	0.0071
Binge drink	5.3 (4.5-6.2)	9.701 (3.026, 31.102)	<0.0001	14.2 (12.5-16.0)	14.957 (6.068, 36.870)	<0.0001

[a] All logistic regressions were conducted using a complete case methods approach, so findings presented here are among all cases with complete data
high sampling variability/insufficient sample size – data suppressed.
* moderate sampling variability, interpret with caution.
CSTADS Canadian Student Tobacco Alcohol and Drug Survey; *n* number; *OR* odds ratio; *CI* confidence interval

Table 3: Logistic regression analysis[a] of variables related to the odds of driving within 2 hours of using marijuana among Canadian grades 9-12 students: 2014/2015 CSTADS

	Last 30 days (n=22,614)	OR (99% CI)	p value	Ever (n=22,614)	OR (99% CI)	p value
Canada (total)	3.2 (2.7-3.7)			6.6 (5.9-7.3)		
Sex						
Female	2.2 (1.5-2.8)	0.455 (0.284, 0.729)	<0.0001	5.0 (4.1-5.9)	0.513 (0.370, 0.710)	<0.0001
Male	4.2 (3.5-4.9)	Ref		8.1 (7.1-9.1)	Ref	
Grade						
9	1.3 (0.8–1.8)*	Ref		3.0 (1.7 – 4.3)*	Ref	
10	2.0 (1.5–2.6)	1.477 (0.760, 2.874)	0.1299	4.5 (3.5 – 5.4)	1.148 (0.682, 1.934)	0.4929
11	3.6 (2.8–4.3)	2.089 (1.003, 4.350)	0.0097	7.3 (6.1-8.4)	1.582 (0.876, 2.859)	0.0455
12	6.0 (4.5–7.4)	2.940 (1.486, 5.819)	<0.0001	11.8 (10.0 – 13.7)	2.469 (1.468, 4.151)	<0.0001
Ethnicity						
White	3.1 (2.5-3.6)	Ref		6.9 (6.0-7.9)	Ref	
Black	4.3 (1.5-7.1)*	2.624 (1.031, 6.676)	0.0078	6.7 (3.3-10.2)*	1.728 (0.788, 3.787)	0.0721
Asian	1.6 (0.9-2.4)*	1.073 (0.576, 1.999)	0.7704	2.8 (2.0-3.5)	0.787 (0.464, 1.334)	0.2407
Latin American	#	4.945 (0.927, 26.385)	0.0139	#	3.289 (1.104, 9.797)	0.0050
Aboriginal	10.3 (7.7-13.0)	3.116 (1.715, 5.659)	<0.0001	19.0 (14.0-24.1)	2.596 (1.573, 4.282)	<0.0001
Other	2.5 (0.9-4.2)*	1.436 (0.647, 3.188)	0.2407	6.2 (3.2-9.3)*	1.540 (0.742, 3.198)	0.1272
Provinces						
NL	7.0 (5.5-8.4)	2.586 (1.505, 4.444)	<0.0001	12.9 (11.0-14.8)	2.353 (1.607, 3.445)	<0.0001
PE	7.4 (6.2-8.5)	2.649 (1.458, 4.814)	<0.0001	11.5 (9.9-13.0)	1.979 (1.370, 2.858)	<0.0001
NS	5.1 (4.4-5.8)	1.726 (1.039, 2.867)	0.0056	10.0 (8.6-11.5)	1.750 (1.281, 2.392)	<0.0001
QC	1.8 (0.9-2.8)*	0.535 (0.238, 1.203)	0.0466	5.0 (2.4-7.6)*	0.805 (0.393, 1.646)	0.4327
ON	2.5 (1.7-3.3)	Ref		5.0 (4.2-5.9)	Ref	
MB	4.7 (2.8-6.6)*	1.229 (0.582, 2.593)	0.4755	10.9 (6.4-15.4)*	1.686 (0.875, 3.249)	0.0400
SK	6.9 (2.8-11.0)*	2.015 (0.980, 4.141)	0.0122	14.0 (5.4-22.6)*	2.273 (1.141, 4.528)	0.0022
AB	2.4 (1.6-3.2)*	0.914 (0.459, 1.822)	0.7365	5.5 (4.4-6.6)	1.130 (0.711, 1.795)	0.4948
BC	5.0 (3.6-6.4)	1.694 (0.764, 3.756)	0.0876	9.5 (6.9-12.1)	1.774 (0.944, 3.334)	0.0192
School SES						
Low Median	3.6 (2.6-4.7)	Ref		7.8 (6.1-9.5)	Ref	
High Median	2.8 (2.3-3.3)	0.999 (0.510, 1.956)	0.9968	5.6 (4.8-6.4)	0.949 (0.558, 1.615)	0.7989
Urban						
Yes	2.9 (2.4-3.4)	Ref		5.8 (4.9-6.7)	Ref	
No	4.3 (2.7-5.9)*	1.026 (0.566, 1.860)	0.9112	9.6 (7.8-11.5)	1.104 (0.738, 1.653)	0.5253
Drinking behaviour						
Don't Drink	#	Ref		0.8 (0.3-1.3)*	Ref	
Drink (no binge)	0.5 (0.3-0.6)*	1.001 (0.298, 3.365)	0.9978	1.3 (0.9-1.7)*	1.401 (0.588, 3.337)	0.3158

Binge drink	6.6 (5.7-7.6)	13.365 (4.407, 40.525)	<0.0001	13.7 (12.3-15.2)	16.252 (6.576, 40.164)	<0.0001

[a] All logistic regressions were conducted using a complete case methods approach, so findings presented here are among all cases with complete data

high sampling variability/insufficient sample size – data suppressed.

* moderate sampling variability, interpret with caution.

CSTADS Canadian Student Tobacco Alcohol and Drug Survey; *n* number; *OR* odds ratio; *CI* confidence interval

Table 4: Logistic regression analysis[a] of variables related to the odds of riding with a driver who had at least one drink within the last hour among Canadian grades 9-12 students: 2014/2015 CSTADS

	Last 30 days (n=22,828)	OR (99% CI)	p value	Ever (n=22,828)	OR (99% CI)	p value
Canada (total)	11.0 (10.2-11.9)			34.6 (32.4-36.9)		
Sex						
Female	12.2 (10.9-13.6)	1.246 (1.000-1.553)	0.0100	38.2 (35.5-41.0)	1.342 (1.160-1.552)	<0.0001
Male	9.9 (8.9-10.9)	Ref		31.2 (29.1-33.3)	Ref	
Grade						
9	9.1 (7.6–10.6)	Ref		29.8 (27.1-32.5)	Ref	
10	11.1 (9.9–12.2)	0.985 (0.719-1.350)	0.9015	34.5 (31.9-37.2)	1.020 (0.857-1.215)	0.7668
11	12.4 (11.1–13.7)	1.007 (0.746-1.359)	0.9526	36.9 (34.7-39.1)	1.054 (0.881-1.262)	0.4475
12	11.6 (9.7–13.5)	0.899 (0.664-1.216)	0.3613	37.3 (32.9-41.7)	1.015 (0.814-1.264)	0.8640
Ethnicity						
White	13.4 (12.2-14.6)	Ref		39.6 (36.8-42.5)	Ref	
Black	7.9 (4.3-11.5)*	0.791 (0.417-1.500)	0.3439	24.4 (16.6-32.2)	0.686 (0.438-1.075)	0.0307
Asian	5.5 (4.6-6.5)	0.681 (0.494-0.940)	0.0021	22.4 (20.5-24.3)	0.796 (0.631-1.005)	0.0115
Latin American	7.7 (4.8-10.7)*	0.605 (0.345-1.060)	0.0209	39.7 (32.4-47.0)	1.110 (0.697-1.768)	0.5614
Aboriginal	12.4 (9.8-15.0)	0.856 (0.564-1.298)	0.3345	42.7 (37.6-47.8)	1.005 (0.738-1.370)	0.9659
Other	11.0 (8.1-13.9)	1.053 (0.660-1.679)	0.7762	30.1 (22.3-37.9)	0.876 (0.569-1.350)	0.4301
Provinces						
NL	10.0 (8.3-11.7)	0.866 (0.682-1.101)	0.1225	31.4 (26.2-36.7)	0.790 (0.580-1.075)	0.0481
PE	10.6 (9.0-12.2)	0.930 (0.634-1.366)	0.6266	34.8 (31.9-37.8)	0.888 (0.643-1.225)	0.3384
NS	9.2 (7.8-10.7)	0.821 (0.621-1.086)	0.0684	30.6 (27.8-33.3)	0.802 (0.591-1.088)	0.0622
QC	15.4 (12.4-18.5)	1.347 (0.912-1.990)	0.0486	43.8 (40.0-47.5)	1.217 (0.868-1.705)	0.1336
ON	9.1 (7.8-10.3)	Ref		30.9 (26.7-35.1)	Ref	
MB	9.1 (7.0-11.1)	0.891 (0.582-1.365)	0.4848	30.5 (24.4-36.6)	0.790 (0.521-1.197)	0.1426
SK	14.7 (11.3-18.1)	1.442 (1.040-1.998)	0.0039	38.7 (29.1-48.2)		0.6669
AB	9.9 (7.6-12.1)	1.193 (0.801-1.776)	0.2526	31.3 (28.7-33.8)	1.005 (0.738-1.368)	0.9670
BC	11.4 (8.8-13.9)	1.230 (0.853-1.773)	0.1449	34.9 (28.7-41.1)	1.052 (0.770-1.439)	0.6728
School SES						
Low Median	12.2 (10.9-13.6)	Ref		40.0 (37.0-43.0)	Ref	
High Median	10.1 (8.8-11.4)	0.989 (0.806-1.213)	0.8864	30.3 (27.1-33.4)	0.787 (0.620-1.000)	0.0099
Urban						
Yes	9.6 (8.6-10.7)	Ref		30.7 (28.3-33.3)	Ref	
No	16.4 (14.1-18.6)	1.117 (0.871-1.431)	0.2508	49.5 (46.2-52.8)	1.403 (1.149-1.713)	<0.0001
Drinking behaviour						
Don't Drink	3.6 (3.0-4.3)	Ref		17.2 (15.0-19.4)	Ref	
Drink (no binge)	8.1 (6.8-9.5)	2.122 (1.390, 3.240)	<0.0001	32.9 (29.1-36.8)	2.045 (1.578, 2.649)	<0.0001

Binge drink	18.5 (17.1-20.0)	5.068 (3.470, 7.404)	<0.0001	49.8 (47.1-52.6)	3.835 (3.082, 4.771)	<0.0001

[a] All logistic regressions were conducted using a complete case methods approach, so findings presented here are among all cases with complete data

high sampling variability/insufficient sample size – data suppressed.

* moderate sampling variability, interpret with caution.

CSTADS Canadian Student Tobacco Alcohol and Drug Survey; *n* number; *OR* odds ratio; *CI* confidence interval

Table 5: Logistic regression analysis[a] of variables related to the odds of riding with a driver who had marijuana within two hours of driving among Canadian grades 9-12 students: 2014/2015 CSTADS

	Last 30 days (n=22,648)	OR (99% CI)	p value	Ever (n=22,648)	OR (99% CI)	p value
Canada (total)	9.0 (7.9-10.1)			19.8 (18.0-21.6)		
Sex						
Female	8.9 (7.7-10.2)	0.989 (0.633, 1.274)	0.4279	19.9 (18.0-21.8)	0.917 (0.715, 1.175)	0.3663
Male	9.1 (7.6-10.7)	Ref		19.6 (17.4-21.8)	Ref	
Grade						
9	4.0 (2.9–5.0)	Ref		9.1 (6.9-11.3)	Ref	
10	6.4 (5.3–7.5)	1.330 (0.952, 1.858)	0.0277	15.5 (13.0-18.0)	1.352 (0.955, 1.915)	0.0252
11	10.6 (9.2–11.9)	1.890 (1.209, 2.955)	0.0003	22.5 (20.5-24.4)	2.989 (1.316, 2.738)	<0.0001
12	15.4 (11.8–19.1)	2.560 (1.469, 4.459)	<0.0001	32.4 (27.4-37.4)	2.941 (1.880, 4.602)	<0.0001
Ethnicity						
White	10.3 (8.6-11.9)	Ref		22.9 (20.0-25.8)	Ref	
Black	8.2 (4.4-12.1)*	1.260 (0.593, 2.678)	0.4281	17.0 (11.7-22.2)	1.076 (0.586, 1.972)	0.7564
Asian	4.3 (3.1-5.5)	0.724 (0.494, 1.061)	0.0294	8.3 (7.0-9.5)	0.535 (0.335, 0.853)	0.0006
Latin American	6.6 (3.5-9.8)*	0.826 (0.346, 1.972)	0.5699	23.9 (17.5-30.3)	1.399 (0.630, 3.105)	0.2770
Aboriginal	20.1 (16.5-23.7)	2.095 (1.467, 2.993)	<0.0001	38.8 (33.0-44.6)	1.942 (1.362, 2.770)	<0.0001
Other	7.3 (4.1-10.4)*	1.004 (0.450, 2.239)	0.9897	17.5 (11.6-23.5)*	1.066 (0.524, 2.169)	0.8163
Provinces						
NL	15.9 (12.6-19.3)	1.936 (1.096, 3.418)	0.0028	31.3 (28.1-34.5)	1.929 (1.260, 2.955)	<0.0001
PE	15.3 (13.6-17.1)	1.879 (1.210, 2.919)	0.0002	29.2 (26.9-31.6)	1.747 (1.194, 2.558)	0.0002
NS	13.8 (11.9-15.7)	1.628 (1.000, 2.651)	0.0100	27.8 (25.4-30.3)	1.719 (1.147, 2.578)	0.0006
QC	6.7 (4.5-9.0)*	0.826 (0.505, 1.353)	0.3182	17.9 (12.5-23.4)*	0.932 (0.541, 1.608)	0.7397
ON	7.8 (5.7-9.8)	Ref		17.2 (14.2-20.1)	Ref	
MB	10.0 (7.2-12.9)	1.006 (0.584, 1.734)	0.9778	22.5 (16.7-28.2)	1.128 (0.641, 1.985)	0.5821
SK	14.3 (8.6-20.0)*	1.478 (0.876, 2.494)	0.0543	27.1 (15.9-38.4)*	1.332 (0.742, 2.389)	0.2054
AB	8.1 (6.6-9.6)	1.199 (0.758, 1.898)	0.3063	18.5 (16.9-20.1)	1.323 (0.942, 1.858)	0.0337
BC	12.8 (9.7-15.9)	1.792 (1.054, 3.048)	0.0047	24.9 (19.6-30.3)	1.692 (1.114, 2.570)	0.0012
School SES						
Low Median	10.1 (8.0-12.2)	Ref		22.9 (19.2-26.6)	Ref	
High Median	8.2 (6.7-9.6)	1.035 (0.562, 1.908)	0.8836	17.2 (14.9-19.5)	0.944 (0.611, 1.458)	0.7323
Urban						
Yes	8.5 (7.2-9.8)	Ref		18.2 (16.1-20.4)	Ref	
No	11.1 (8.7-13.5)	0.853 (0.606, 1.201)	0.2300	25.5 (21.9-29.2)	0.899 (0.644, 1.254)	0.4081
Drinking behaviour						
Don't Drink	1.3 (0.9-1.7)*	Ref		3.4 (2.8-4.0)	Ref	
Drink (no binge)	3.2 (2.5-4.0)	2.184 (1.417, 3.365)	<0.0001	9.4 (8.1-10.7)	2.462 (1.865, 3.250)	<0.0001
Binge drink	18.1 (16.1-20.1)	13.317 (8.135, 21.801)	<0.0001	37.5 (34.5-40.5)	12.901 (9.887, 16.834)	<0.0001

[a] All logistic regressions were conducted using a complete case methods approach, so findings presented here are among all cases with complete data
high sampling variability/insufficient sample size – data suppressed.
* moderate sampling variability, interpret with caution.
CSTADS Canadian Student Tobacco Alcohol and Drug Survey; *n* number; *OR* odds ratio; *CI* confidence interval

Title: Under the influence: A cross-sectional examination of prevalence and correlates of alcohol and marijuana consumption in relation to youth driving and passenger behaviours in Canada from 2014/2015 CSTADS

Running Head: Youth driving after alcohol and marijuana use

Authors' names:

Leia M. Minaker, PhD
Affiliation: 1) School of Planning, Faculty of Environment, University of Waterloo
2) Propel Centre for Population Health Impact, University of Waterloo
Email: lminaker@uwaterloo.ca

Aaron Bonham, MSc
Affiliation: 1) Propel Centre for Population Health Impact, University of Waterloo
Email: abonham@uwaterloo.ca

Tara Elton Marshall, PhD
Affiliation: 1) Institute for Mental Health Policy Research, Centre for Addiction and Mental Health
2) Dalla Lana School of Public Health, University of Toronto
Email: tara.eltonmarshall@camh.ca

Cesar Leos-Toro, PhD (cand)
Affiliation: 1) School of Public Health & Health Systems, University of Waterloo
Email: cesar.leos-toro@uwaterloo.ca

T. Cameron Wild, PhD
Affiliation: 1) School of Public Health, University of Alberta.
Email: cwild@ualberta.ca

David Hammond, PhD
Affiliation: 1) School of Public Health & Health Systems, University of Waterloo
Email: dhammond@uwaterloo.ca

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