

Passengers' Decisions to Ride With a Driver Under the Influence of Either Alcohol or Cannabis*

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ABSTRACT. Objective: The purpose of the present study was to identify the risk factors associated with passenger decisions to ride with a driver who is under the influence of either alcohol or cannabis. **Method:** We analyzed data from the 2008 Canadian Alcohol and Drug Use Monitoring Survey (CADUMS), a nationally represented telephone sample of 16,672 Canadians age 15 and older, of whom 60.5% were female. Logistic regression analyses explored the effects of sociodemographic, substance use, and driving-behavior factors on the risk of riding with a drinking driver (RWDD) and riding with a cannabis-impaired driver (RWCD). **Results:** Risk factors for RWDD and RWCD were both shared and unique. Common risk factors were respondents' age, with young people at increased risk and those 65 years and older at decreased risk, and problematic alcohol use (as measured by Alcohol Use Disorder

Identification Test subscales). Having previously driven under the influence of alcohol increased the risk of RWDD, while RWCD was associated with having previously driven under the influence of cannabis. **Conclusions:** Considerable legal and public health attention has been devoted to eliminating impaired driving, with particular focus on driver behavior. However, with the knowledge that impaired driving is strongly related to being a passenger of an impaired driver, prevention efforts to reduce the prevalence of impaired driving must be multifaceted, targeting passengers as well as drivers. Links between attitudes, beliefs, risk-taking behavior, and related structural conditions should be emphasized, with passengers being encouraged to recognize impairment in others and make sensible choices. (*J. Stud. Alcohol Drugs*, 72, 86-95, 2011)

DESPITE POLICY AND PREVENTION EFFORTS, alcohol-related motor vehicle collisions continue to be a serious concern for policymakers in the fields of health and justice, as well as for the general public. Between 2003 and 2005, almost 30% of deaths from vehicle crashes in Canada were found to have been influenced to some extent by alcohol use on the part of drivers (Transport Canada, 2008). In 2006, this number increased to 37%, equating to 1,046 drivers, passengers, cyclists, and passers-by being killed annually by drivers under the influence of alcohol or drugs (Traffic Injury Research Foundation, 2009). Driving under the influence is equally problematic in the United States, with as many as 40% of fatal motor vehicle crashes involving alcohol (Dellinger et al., 1999) and approximately 17,000 drivers being killed each year (Flowers et al., 2008).

Although alcohol is still the substance most strongly associated with driving under the influence, more recent evidence suggests that this trend may be changing. Results from the 2008 Canadian Alcohol and Drug Use Survey (CADUMS) indicate that approximately 11.4% of Canadians have used cannabis at least once in the previous year, with as many as

33% of 15- to 24-year-olds having done so (Health Canada, 2008). In addition, driving a motor vehicle while under the influence of cannabis has become more commonplace in recent years. Data collected in 2003 indicate that 4% of Canadian adults reported driving after consuming cannabis in the previous hour, double the rate that was reported in 1996-1997 (Center for Addiction and Mental Health, 2003). Recent research has indicated that the prevalence of driving under the influence of cannabis in certain populations may in fact have *surpassed* rates of driving under the influence of alcohol, with high school students in particular reporting high rates of driving within 1 hour of using cannabis (Adlaf et al., 2003; Asbridge et al., 2005; Bierness et al., 2003). Driving after using cannabis has been found to increase the risk of motor vehicle collisions (Asbridge et al., 2005; Dussault et al., 2002), and cannabis has become the second most commonly found drug in deceased and injured drivers after alcohol (Cimbura et al., 1990; Stoduto et al., 1993).

Although a number of studies have explored the factors that contribute to driving while under the influence of alcohol or drugs, less attention has been directed to an exploration of the behavior of passengers who ride with impaired drivers. In 2001, around 4% of Canadians age 15 and older reported having been a passenger of a driver who was under the influence of alcohol in the past year (Health Canada, 2008), and provincial surveys in the maritime provinces and Ontario reported that between 20% and 30% of high school students had been passengers of an alcohol-impaired driver (Adlaf et al., 2003; Poulin et al., 2007). Between 2003 and 2005, passengers accounted for 22% of fatalities

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in alcohol-related crashes, with this number increasing to almost 97% when passengers were between 16 and 24 years old (Transport Canada, 2008). Although the number of passengers killed in alcohol-related motor vehicle collisions has gradually decreased over the past 5 years (Transport Canada, 2008), the rate of collision-related injuries has remained steady over the same period (Canadian Institute for Health Information, 2008).

Passengers who ride with a driver under the influence of alcohol report a greater number of occasions of driving under the influence themselves (Shults et al., 2009), and the presence of more than one passenger riding with a teenage or adolescent drinking driver seems to increase the risk of that driver being involved in a collision (Preusser et al., 1998; Williams et al., 2007). There is, therefore, the potential for passengers to be used as agents of change when constructing policy to reduce rates of driving under the influence of alcohol or drugs. The vast majority of passengers of fatally and nonfatally injured drunk drivers are found to have levels of alcohol intoxication similar to the drivers (Isaac et al., 1995; Soderstrom et al., 1996); estimates of fatal motor vehicle accidents involving an alcohol-impaired driver where passengers were sober or relatively unimpaired are estimated to be anywhere from 0% (Perper et al., 1993) through 5%-10% (Isaac et al., 1995) to 13% (Soderstrom et al., 1996). Studies such as these provide increasing support for the view that passengers who ride with a driver under the influence of alcohol should continue to be educated alongside drivers themselves in order to reduce the health and economic burden of alcohol- or drug-related motor vehicle collisions (Dellinger et al., 1999).

Commonly identified risk factors for driving under the influence include alcohol or drug use and misuse (Jonah, 1997; Peden et al., 2004; Petridou et al., 1997), living in rural areas where transportation options are limited (O'Malley and Johnston, 1999), and younger age (Pérez, 2005; Beirness and Davis, 2007). However, studies exploring the risk factors that affect a passenger's decision to ride with a driver under the influence have been limited (Leadbeater et al., 2008; Poulin et al., 2007; Yu and Shackel, 1999). An understanding of the individual and structural factors that influence a passenger's decision to ride with a driver even when aware that the driver has consumed alcohol or drugs would therefore be useful in terms of both policy and program development.

Poulin et al. (2007) employed an ecological model to examine individual (socioeconomic status, rural residence, substance use, and driving behavior) and school/neighborhood (prevalence of heavy drinking, driving under the influence of alcohol, having a driver's license, educational attainment, and low income) effects on past-year riding with a drinking driver (RWDD) among students in Grades 9-12 in Atlantic Canada. Risk factors for RWDD were found to be female gender, the lack of one or more parents in the family living structure, lower family socioeconomic status, younger age

at first alcohol use, prior alcohol or cannabis use, previously having driven under the influence of alcohol or cannabis, and low educational attainment. Having a driver's license was found to be protective for RWDD. Although passenger risk factors for riding with a drinking driver were considered, the study did not look at riding with drivers who were under the influence of cannabis or other drugs.

Leadbeater et al. (2008) examined the effects of youth attitudes regarding smoking cannabis or drinking alcohol and the influence of being a passenger of an adult or peer who drove after using alcohol or cannabis on youths' own experiences of driving under the influence of alcohol or cannabis. Students in Grades 10-12 from high schools in British Columbia were surveyed, with regression analyses controlling for age, sex, and urban/rural community. High-risk attitudes toward alcohol and drug use and experiences riding with peers who drove under the effects of alcohol or cannabis were found to be independently associated with students' driving-risk behaviors. Youths who had frequently ridden with an adult under the influence of cannabis or alcohol were found to be at highest risk for such behavior.

Current study

The purpose of the present study was to identify risk and protective factors for passengers' decisions to knowingly ride with a driver who is under the influence of either alcohol or cannabis. Although the study by Leadbeater et al. (2008) looked at both alcohol and cannabis, both this study and that of Poulin et al. (2007) focused on students in Grades 9-12, with no consideration of adult behavior. Using national data from the Canadian Alcohol and Drug Use Monitoring Survey, the intention of the current study was to consider both young people and adults, examining risk factors from three domains—sociodemographic factors, substance use behaviors, and driving behavior—in relation to riding with a driver who is under the influence of alcohol (RWDD) or cannabis (RWCD). This is particularly relevant given the observed increase in driving under the influence of cannabis in Canada and abroad, predominantly among young people (Asbridge et al., 2005; Walsh and Mann, 1999). We were also interested in the additional question of whether the risk factors associated with riding with a drinking driver were similar or unique to those that influence riding with a cannabis-impaired driver.

In studying the factors that affect a passenger's decision to ride with a driver under the influence, it is important to consider the passenger's licensing status and exposure to driving in order to give context to their driving and riding experiences (Voas and Kelley-Baker, 2007). Passengers in older and underage categories have limited access to vehicles, and the majority of these respondents may not be licensed at all; this may skew estimates of how strongly driving behaviors are linked to riding with impaired drivers

(Voas and Kelley-Baker, 2007). Recent studies have found that being a passenger with a driver who had been drinking was more likely for youths younger than 16 years of age, most of whom did not have a driver's license (Sabel et al., 2004), and that having a driver's license is protective for riding with a drinking driver (Poulin et al., 2007). We have therefore included a measure of whether respondents have ever driven without a license in our analyses, as well as whether respondents are daily drivers.

Method

Data

We analyzed data from the 2008 CADUMS. The CADUMS was designed by Health Canada to measure the prevalence and use of alcohol and prescription and illicit drugs in the population, as well as the effects of substance use on health and daily activities. The methods and procedures used by the CADUMS are similar to those of the 1989 National Alcohol and Drugs Survey, the 1994 Canada Alcohol and Other Drugs Survey, and the 2003/2004 Canadian Addiction Survey. However, where these surveys were irregular or one time only, the CADUMS has been structured as an ongoing monitoring system, with surveys being carried out each year to detect trends and patterns in substance use and misuse among Canadians (Health Canada, 2009).

The CADUMS survey was administered by Health Canada between April and December 2008 and involved 16,672 Canadians age 15 and older, across ten provinces, with equal numbers of respondents surveyed by telephone each month. Response rates varied from 39.3% for British Columbia to 51.5% for Quebec, resulting in an overall response rate of 43.5% across all provinces (Health Canada, 2009).

Measures

Primary measures were respondents' past experiences of riding with a driver under the influence of alcohol or cannabis (RWDD and RWCD, respectively). RWDD was assessed by the CADUMS question, "In the past twelve months, have you been a passenger in a motor vehicle driven by someone who had 2 or more drinks of alcohol in the previous hour?" Similarly, RWCD was assessed by the question, "In the past twelve months, have you been a passenger in a motor vehicle driven by someone who had been using marijuana in the previous 2 hours?" Use of drugs other than cannabis in the past 12 months on the part of passengers was considered only as a potential risk factor for RWDD and RWCD. A further question covering riding with drivers who had consumed both cannabis and alcohol was not included as a dependent variable because of the limited number of responses.

A series of potential risk factors related to respondents' past substance use and driver behavior were included in our

analyses. Alcohol use/misuse was assessed using scores based on subscales of the Alcohol Use Disorders Identification Test (AUDIT), developed by the World Health Organization (Reinert and Allen, 2007; Saunders et al., 1993). The AUDIT is a 10-item questionnaire designed to identify people with a pattern of drinking in the past 12 months that places them at increased likelihood of future physical and mental health problems. Three subscales of the AUDIT measuring different dimensions of alcohol use—consumption/intake, dependence, and adverse consequences of use/misuse—were used. These subscales have been confirmed in factor analytic studies (Bailey and Rachal, 1993; Saunders et al., 1993) and provide a parsimonious means of measuring the major domains of alcohol-related behaviors and problems. The AUDIT consumption/intake of alcohol score was derived from responses to survey questions regarding respondents' frequency of drinking over the past year and number of drinks consumed per sitting. Dependence on alcohol was derived from responses to questions on being able to stop drinking, failing to do what was normally expected because of drinking, and needing to drink in the morning after a heavy session. Adverse consequences of alcohol use/misuse scores were derived from responses to questions covering feelings of guilt or remorse in the past year, memory loss or injuries as a result of drinking, and others' concern for respondents' welfare because of alcohol.

Research conducted on the AUDIT has shown that drivers with high AUDIT scores have increased risk for traffic violations (Hubicka et al., 2008) and traffic collision involvement (del Rio et al., 2001) and increased recidivism to driving under the influence of alcohol (in combination with age older than 28 years and other criminality) (Hubicka et al., 2008). In a study that examined drivers suspected of driving under the influence of alcohol, more than half of them had AUDIT scores greater than eight (Bergman et al., 2005).

Cannabis dependence was assessed using the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). The ASSIST was developed for the World Health Organization (WHO) to screen for problem or risky use of a number of drugs across 10 categories, including cannabis. It was designed for use as a screening tool that could be used across a range of countries and cultures. The ASSIST has been found to have good reliability (WHO ASSIST Working Group, 2002) and can effectively screen for low, moderate, and high levels of substance abuse risk, as well as substance dependence (Humeniuk et al., 2008).

The ASSIST risk level was calculated based on answers to questions regarding frequency of cannabis use over the past 3 months, desire to use cannabis, problems resulting from cannabis use, failure to perform normal tasks, concern on the part of others because of cannabis use, and unsuccessful attempts to stop using cannabis. CADUMS survey responses were recoded and summed, with total scores of 4 and above being classed as moderate/high risk of developing health and

other problems (eventually likely to be dependent) and total scores of 3 and below being classed as low risk of developing health and other problems. In addition to cannabis use, respondents' answers to a survey question regarding drug consumption in the past 12 months (excluding cannabis) were included in our analyses.

Driver behavior was assessed through respondents' answers to questions regarding whether they had ever driven a motor vehicle within 1 hour of drinking two or more drinks (yes/no), driven a motor vehicle within 2 hours after using cannabis (yes/no), driven without a valid license, including a graduated license (yes/no), and how often they drove a motor vehicle in the past 12 months (daily driving/less than daily driving).

Additional covariates included in all models were respondent age (measured in five categories as 15-17, 18-24, 25-44, 45-64, and ≥65 years), sex (female/male), lowest household income (categorical measure indicating whether the individual was in the lowest income category), education (measured in four categories as less than secondary school graduation, secondary school graduation with no postsecondary education, some postsecondary education, and postsecondary degree/diploma), and marital status (dichotomized as married/living with partner/common-law and other). Table 1 provides descriptive statistics for all measures used in the analysis.

Analysis

Adjusted and unadjusted logistic regression models were employed to identify significant risk factors for RWDD and RWCD. Only variables that were significant in the unadjusted model were included in the adjusted model; statistical significance for all analyses was set to two-sided $\alpha < .01$. For the CADUMS data to be representative of the survey population (all Canadians age ≥15), we used the recommended survey weights that adjusted for sex, age, and 21 administrative areas across the country. Data analysis was conducted using Stata 10 (StataCorp, LP, College Station, TX), and the survey commands were employed to account for the complex structure of the data. Table 1 describes the unweighted sample *n* for all variables in the analysis, together with weighted prevalence representative of the total Canadian population age 15 and older (Health Canada, 2009). We found no evidence of multicollinearity in all our models, as the tolerance and variance inflation factors for all measures were well within acceptable levels.

Results

The prevalence of Canadians age 15 and older who reported riding with a driver under the influence of alcohol in the past year was 14%, whereas slightly more than 8% reported riding with a driver under the influence of cannabis; comparatively fewer individuals self-identified as having

TABLE 1. Unweighted sample *n* and weighted prevalence and means for variables used in analyses

Variables	Unweighted sample <i>n</i>	Weighted prevalence or <i>M</i>
Age		
15-17	455	4.8%
18-24	988	11.4%
25-44	5,204	33.9%
45-64	6,508	33.2%
≥65	3,485	16.7%
Sex		
Female	10,079	51.5%
Male	6,595	48.5%
Education		
Less than high school	2,554	16.3%
Completed high school	4,125	24.1%
Some postsecondary	5,318	31.3%
Completed university	4,528	28.3%
Marital status		
Married/cohabiting with partner/common-law	10,201	57.8%
Single/unmarried	6,334	42.2%
Income adequacy		
Lowest income	1,338	7.5%
Middle income	4,934	28.6%
Highest income	5,392	32.1%
Not stated	5,010	31.7%
Substance use		
Low ASSIST risk level	15,749	93.2%
Moderate/high ASSIST risk level	824	6.8%
AUDIT consumption (0-3)	16,453	2.93
AUDIT dependence (0-3)	16,582	0.17
AUDIT adverse consequences (0-4)	16,574	0.62
Driving		
No DUIA	15,586	91.3%
DUIA	1,088	8.7%
No DUIC	16,347	97.1%
DUIC	327	2.9%
Has never driven without a license	16,342	97.5%
Has driven without a license	332	2.5%
Less than daily driving	4,557	20.9%
Daily driving	12,117	79.1%
Riding with a driver under the influence of alcohol		
Yes	1,979	14.0%
No	14,550	86.0%
Riding with a driver under the influence of cannabis		
Yes	1,023	8.3%
No	15,517	91.7%

Notes: ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDIT = Alcohol Use Disorders Identification Test; DUIA = driving under the influence of alcohol; DUIC = driving under the influence of cannabis.

driven under the influence of alcohol (8.7%) or cannabis (2.9%). Although not reported in Table 1, 77% of Canadians consumed alcohol in the past 12 months and 64% in the last 30 days; only 11% reported using cannabis in the past year, with 8% doing so in the last 30 days.

Tables 2 and 3 show unadjusted and adjusted odds ratios (ORs) and Wald *ts* for the independent variables used in our analyses, where dependent variables are RWDD and RWCD. In the adjusted model, only two sociodemographic factors were significantly related to riding with a driver who

TABLE 2. Logistic regression of riding with drivers under the influence of alcohol on sociodemographic, substance use, and driving measures (odds ratios [ORs] and Wald *t* reported)

Variable	Unweighted <i>n</i> and weighted prevalence		Unadjusted model		Adjusted model	
	<i>n</i>	Prev.	OR	Wald <i>t</i>	OR	Wald <i>t</i>
Age						
15-17	90	14.6	1.58	1.98	1.24	0.74
18-24	320	31.2	4.18	9.62*	2.29	4.04*
25-44	820	16.8	1.85	5.58*	1.66	3.95*
45-64 (referent)	618	9.8	1.00	—	1.00	—
≥65	129	4.9	0.47	-3.89*	0.63	-2.38
Sex						
Male (referent)	991	16.9	1.00	—	—	—
Female	988	11.2	0.62	-5.08*	1.24	1.79
Education						
Less than high school	240	11.4	0.98	-0.15	—	—
Completed high school	492	12.7	1.09	0.66	—	—
Some postsecondary	754	18.7	1.73	4.37*	—	—
Completed university (referent)	490	11.7	1.00	—	—	—
Marital status						
Single/unmarried (referent)	938	18.8	1.00	—	1.00	—
Married/cohabiting with partner	1,033	10.6	0.51	-7.08*	0.58	-4.46*
Income adequacy						
Lowest income	112	11.3	0.63	-2.19	—	—
Middle income	560	14.3	0.82	-1.72	—	—
Highest income (referent)	827	17.0	1.00	—	—	—
Not stated	480	11.2	0.62	-3.81*	—	—
AUDIT consumption			1.43	17.48*	1.24	8.27*
AUDIT dependence			1.66	5.67*	0.98	-0.12
AUDIT adverse consequences			1.42	11.62*	1.12	2.83*
ASSIST						
Low risk level (referent)	1,670	12.2	1.00	—	1.00	—
Moderate/high risk level	289	37.4	4.27	9.54*	1.30	1.10
Driving after using alcohol						
No (referent)	1,381	10.4	1.00	—	1.00	—
Yes	598	58.8	12.29	19.22*	7.75	13.16*
Driving after using cannabis						
No (referent)	1,831	13.1	1.00	—	1.00	—
Yes	148	48.0	6.12	8.12*	1.17	0.47
Driving without a license						
No (referent)	1,904	13.7	1.00	—	—	—
Yes	75	23.9	1.98	2.25	—	—
Daily driving						
No (referent)	490	13.3	1.00	—	—	—
Yes	1,499	14.3	1.09	0.76	—	—
<i>F</i> statistic	<i>F</i> (12, 15951) = 44.72					

Notes: Prev. = prevalence; OR = odds ratio; AUDIT = Alcohol Use Disorders Identification Test; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test.

**p* < .01.

was under the influence of alcohol. Respondents in two age groups (18-24 and 25-44) had increased odds of RWDD, whereas being married reduced the likelihood of RWDD. Respondents' sex, level of education, and income level were unrelated to RWDD. For RWCD, only age was significant; respondents ages 15-17 (OR = 2.71), 18-24 (OR = 5.45), and 25-44 (OR = 2.37) were all significantly more likely than 45- to 64-year-olds to ride with a cannabis-impaired driver, whereas respondents age 65 and older had decreased odds of RWCD.

Measures of substance use and driving behavior exhibited strong effects on RWDD and RWCD, with some common and unique risk factors. AUDIT scores indicating higher al-

cohol consumption and experiences of adverse consequences from drinking were highly predictive of RWDD and RWCD. Meanwhile, respondents who had driven under the influence of alcohol themselves were almost eight times as likely as nondrinking drivers to ride with a drinking driver. Having driven under the influence of cannabis had a similarly strong relationship with RWCD, with individuals who had driven under the influence of cannabis being nearly six times as likely as those who had not driven under the influence of cannabis to ride with a cannabis-impaired driver. The most robust influence on RWCD was scoring on the moderate/high risk level on the ASSIST, indicating problematic cannabis consumption, with an eightfold increase in RWCD. Neither

TABLE 3. Logistic regression of riding with drivers under the influence of cannabis on sociodemographic, substance use, and driving measures (odds ratios [ORs] and Wald *t* reported)

Variable	Unweighted <i>n</i> and weighted prevalence		Unadjusted model		Adjusted model	
	<i>n</i>	Prev.	OR	Wald <i>t</i>	OR	Wald <i>t</i>
Age						
15-17	90	19.3	7.53	7.85*	2.71	2.59*
18-24	269	31.1	14.14	13.96*	5.45	6.15*
25-44	444	8.1	2.76	6.16*	2.37	4.31*
45-64 (referent)	200	3.1	1.00	—	1.00	—
≥65	20	0.4	0.12	-5.45*	0.18	-4.12*
Sex						
Male (referent)	578	10.9	1.00	—	1.00	—
Female	445	5.9	0.52	-5.02*	1.04	0.27
Education						
Less than high school	213	11.7	2.90	4.82*	1.49	1.25
Completed high school	305	9.9	2.41	4.06*	1.41	1.23
Some postsecondary	354	9.2	2.23	3.86*	1.31	1.12
Completed university (referent)	150	4.3	1.00	—	1.00	—
Marital status						
Single/unmarried (referent)	619	13.8	1.00	—	1.00	—
Married/cohabiting with partner	400	4.5	0.29	-9.45*	0.68	-2.12
Income adequacy						
Lowest income	97	7.5	0.96	-0.14	—	—
Middle income	324	9.1	1.19	1.12	—	—
Highest income (referent)	353	7.7	1.00	—	—	—
Not stated	249	8.5	1.10	0.58	—	—
AUDIT consumption			1.45	14.16*	1.21	5.04*
AUDIT dependence			1.66	5.96*	0.75	-2.11
AUDIT adverse consequences			1.57	12.08*	1.20	3.18*
ASSIST						
Low risk level (referent)	561	4.5	1.00	—	1.00	—
Moderate/high risk level	442	60.0	32.12	20.82*	6.53	7.67*
Driving after using alcohol						
No (referent)	818	7.6	1.00	—	1.00	—
Yes	205	17.6	2.61	5.86*	1.16	0.54
Driving after using cannabis						
No (referent)	785	6.6	1.00	—	1.00	—
Yes	238	78.0	50.37	15.45*	8.67	5.71*
Driving without a license						
No (referent)	952	7.7	1.00	—	1.00	—
Yes	71	31.1	5.38	6.26*	1.29	0.60
Daily driving						
No (referent)	374	12.1	1.00	—	1.00	—
Yes	649	6.5	0.50	-5.18*	0.61	-2.44
<i>F</i> statistic	<i>F</i> (17, 15843) = 26.50					

Notes: Prev. = prevalence; OR = odds ratio; AUDIT = Alcohol Use Disorders Identification Test; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test.
**p* < .01.

driving without a license nor driving frequency was related to RWDD and RWCD.

Interestingly, the direct effect of driving under the influence of alcohol on RWCD and driving under the influence of cannabis on RWDD were nonsignificant in the final adjusted model. This finding reflects the interrelationship between both driving under the influence behaviors and suggests that the pathway by which having driven under the influence of alcohol affects RWCD remains contingent on whether the individual has also driven under the influence of cannabis. The same pathway holds true for RWDD.

Finally, although not presented here, we should note that there was a strong association between RWDD and RWCD. When included in the adjusted model for RWDD, RWCD was a significant predictor (OR = 3.01) of RWDD. Similarly, when included in the adjusted model for RWCD, RWDD was significantly related (OR = 3.36) to RWCD.

Discussion

The primary aim of this study was to evaluate the risk factors associated with individuals' decisions to ride as a

passenger with a driver under the influence of either alcohol or cannabis in a sample of individuals age 15 and older. In addition, we wished to determine whether the risk factors for RWDD and RWCD were similar or unique. In keeping with previous research into predictors of passenger behavior, which have identified younger adults and adolescents as most likely to ride with a driver under the influence, we found that respondents in two age groups (18-24 and 25-44) had significantly increased odds of RWDD. Although being 65 years of age and older was protective for RWDD, it was not significantly so. For riding with a driver under the influence of cannabis, membership in all age groups provided significant risk or buffering effects; respondents ages 15-17, 18-24, and 25-44 were all significantly more likely than 45- to 64-year-olds to ride with a cannabis-impaired driver, whereas respondents age 65 and older had significantly decreased odds of RWCD. Assuming that passengers who ride with a driver under the influence of alcohol or cannabis are likely to be of a similar age to the driver, this finding is in line with recent statistics estimating that the majority of drinking drivers in fatal crashes are younger than age 45 (Transport Canada, 2008). The increased risk of RWDD and RWCD for adolescents may stem from many being dependent on others for transportation, especially in rural areas and where drinking and cannabis use has become the norm, for example, among college students (Leadbeater et al., 2008). On the other hand, older passengers in their 20s and 30s may be more likely to accept lifts from impaired drivers who are their partner or spouse, or they may overestimate an impaired driver's ability to safely transport passengers because of previous (uneventful) driving experiences while impaired themselves.

In terms of other risk factors, we found no significant gender effects for either RWDD or RWCD. Prior studies have disagreed over whether males or females are at a higher risk of riding with an impaired driver (Everett et al., 2001; Jelalian et al., 2000; Leadbeater et al., 2008; Poulin et al., 2007), whereas other studies have found that gender is not a significant risk factor for RWDD (Adlaf et al., 2003; Finken et al., 1998; Harré et al., 1996). However, all of these studies relied on surveys of adolescent and high school students, as opposed to our sample, which consisted of Canadian adults. It is therefore difficult to infer whether our finding may be explained by the age of the population under study or whether the interaction between numerous variables led to the nonsignificance of gender as an independent risk factor in our full model. Additional studies of RWDD in adult populations would assist in addressing this question.

As might be expected, AUDIT scores for consumption of alcohol were highly predictive of the probability that respondents would ride with a drinking driver. Scores assessing the adverse consequences of alcohol use were also predictive of RWDD. Interestingly, the same AUDIT measures were also risk factors for RWCD. It can therefore be inferred that many respondents who regularly consumed large quantities

of alcohol or had recently encountered problems stemming from their use of alcohol did not discriminate between riding with a driver who had consumed alcohol or smoked cannabis; the likelihood of both outcomes was increased. This is in contrast to cannabis dependence and other problems, which were strongly related to RWCD only. Frequent users of cannabis were at an increased risk of riding with drivers who had themselves used cannabis but were not likely to ride with drivers who had been drinking.

Turning to driving behavior, consistent with the findings of Poulin et al. (2007) and Yu and Shacket (1999), having driven while under the influence of alcohol was strongly predictive of RWDD, even after other confounders had been controlled for. However, having driven under the influence of cannabis was not a significant predictor of RWDD. The reverse was true for RWCD, where having driven under the influence of cannabis was strongly predictive of RWCD, but having driven under the influence of alcohol was not a significant risk factor.

Much of the existing research into passenger behavior has focused on passengers who ride with a driver under the influence of alcohol. One of the aims of our study was to explore riding with a driver under the influence of cannabis and to answer the question of whether the determinants of RWDD are similar to those of RWCD. From an analysis of our results, coupled with previous work by Leadbeater et al. (2008), we suggest that most of the risk factors for RWDD and RWCD are shared and that, in many cases, the consumption and use of one has clear effects on the decision to ride with a driver who is under the influence of the other. But, as noted above, this is not true for all risk factors. After adjusting for other covariates, problem cannabis use and having driven under the influence of cannabis were strongly associated with RWCD only, while having driven under the influence of alcohol was predictive of RWDD only. How might we interpret the presence of these substance-specific effects?

These findings may speak to social peer or parental effects. Users of alcohol and cannabis may see riding with an impaired driver as normal if they themselves have driven while under the influence of alcohol or cannabis in the past. As Yu and Shacket (1999) point out, driving while under the influence of alcohol is considered to be a socially unacceptable form of behavior; once an incident of drinking and driving has been successfully navigated, riding as a passenger with an impaired driver may not seem to be a serious issue. Young people who see their peers or older role models driving while under the influence of alcohol or who experience being a passenger with a drinking driver are likely to be more willing to drive under the influence of alcohol themselves in the future (Leadbeater et al., 2008). Moreover, the observed lack of a crossover effect between driving behavior and passenger behavior suggests the presence of distinct learning subcultures—riding with a drinking driver begets driving under the influence of alcohol, and so forth. Previous

survey research on substance use patterns in general finds that although concurrent past-year or past-month use of alcohol and cannabis is common, simultaneous use of both drugs during a single occasion remains rare. As Midanik et al. (2007) note, just 7% of respondents to the 2000 National Alcohol Survey in the United States reported using marijuana and alcohol during the same sitting. Our findings may offer additional insight into this issue with respect to driving under the influence.

Study findings must be considered in light of a number of limitations. First, the data were derived from individual self-reports, which can be a particular concern when dealing with questions of a sensitive nature such as those on substance use; however, the measures included in the CADUMS have been well validated to minimize nonreporting and have been employed in a number of national and international surveys (Health Canada, 2009). Second, the response rate for the survey was 43.5%, which raises concern about the validity of the study. Approximately 20% of nonresponses were the result of invalid telephone numbers; the remaining 35% were refusals. Reasons for refusing to participate are many, and include a lack of interest, lack of time, and concerns about revealing personal information. The CADUMS was pretested to address issues concerning the sensitivity of questions and to reduce nonresponse, and appropriate techniques were incorporated for obtaining accurate self-reports. Furthermore, Health Canada completed additional analyses on the sampling distribution to assess its comparability to the Canadian population, drawn from the census. They found that the weighted CADUMS distribution compared favorably to Canadian census data on sex, age, and province of residence, with the CADUMS slightly oversampling married people and those with a university education (Health Canada, 2009). This is likely to have biased the sample to underreport substance using behaviors. Nonetheless, the CADUMS response rate is similar to the rates found in other national telephone surveys (i.e., European Comparative Alcohol Study; United States Behavioral Risk Factor Surveillance System survey), although it is lower than that typically found in household surveys based on face-to-face interviews. Finally, our data did not include psychometric measures or scales of general risk taking that may help explain an individual's propensity to engage in cannabis use and risky driving.

Collectively our findings, together with the trend of increasing cannabis use in Canada (Health Canada, 2008), indicate that current policies and prevention efforts to reduce the incidence of motor vehicle collisions should concentrate not only on drivers but also on passengers who choose to drink and must expand to address the growing prevalence of driving under the influence of cannabis. How this is achieved remains the key challenge. Further work aimed at the prevention of impaired driving should evaluate the benefit of combined programs that look to overcome individual and population impediments to safe transportation choices

or do comparative work across jurisdictions that offer such choices. Research has shown that private vehicles are the most popular form of transportation used by partygoers (Calafat et al., 2009) and therefore are most likely to be used by individuals and groups who have been drinking or using drugs. Increasing the availability of public transport choices or implementing programs such as the "You Hold The Key Teen Driving Countermeasure" (King et al., 2008) would provide drivers and passengers with additional options and help to address these concerns directly. Simultaneously, the health promotion movement, directed at impaired driving awareness and education, can do more to educate the potential passengers of impaired drivers. The P.A.R.T.Y. (Prevent Alcohol and Risk-related Trauma in Youth) program, although aimed at school-age adolescents, tackles issues of driver impairment, including cannabis and other substances, as well as alcohol, and may represent a more innovative approach at reaching impaired drivers and passengers (P.A.R.T.Y. Program, 2009). With the knowledge that having previously driven while under the influence of alcohol influences being a passenger of a drinking driver (Poulin et al., 2007), especially for adolescents or when peers and adults are seen to drive under the influence of alcohol (Leadbeater et al., 2008), efforts to reduce the prevalence of drinking/using drugs and driving should be multifaceted. Links between attitudes, beliefs, and risk-taking behavior should be emphasized, with passengers being encouraged to recognize impairment in others and make sensible choices. This must be balanced with the broader structural determinants that help to shape these decisions, such as issues of rurality and access to safe and affordable transportation. The influence of passengers in reducing alcohol- and drug-related motor vehicle collisions and deaths must not be overlooked.

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