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Risk perceptions of cannabis- vs. alcohol-impaired driving among Canadian young people

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ABSTRACT

Cannabis-impaired driving (CID) is associated with an increased risk of motor vehicle accidents. A number of studies have reported on the prevalence of CID and/or riding in a vehicle with a cannabis-impaired driver (RCID), which appears to have increased in certain jurisdictions. However, there is little evidence on beliefs and perceptions of risk associated with CID vs. alcohol-impaired driving (AID). This study examined perceptions of CID and AID, prevalence of CID, and associations with cannabis use status. Respondents aged 16–30 years in Canada ($n = 870$) were recruited via a commercial panel and completed an online survey in October 2017. Perceptions of risk for CID were significantly lower than those for AID ($p < .001$). Cannabis use status predicted past CID, RCID, and low perceived risk of motor vehicle accidents ($p \leq .01$). CID behaviors were prevalent among young people in Canada: over 40% of respondents reported RCID, and 17% reported CID – including over a third of past-year cannabis users. Respondents also reported a lower willingness to intervene ($p < .001$) and reduced likelihood of legal consequences ($p < .001$) of CID compared to AID. These perceptions may be important barriers to reducing CID and should be prioritized in public education campaigns targeting both youth and young adults.

Introduction

Prior to non-medical cannabis legalization, cannabis was the most commonly used illicit drug in Canada, with the highest rates of use among Canadian young people: 36% and 44% of 16–19 and 20–24 year-olds reported past 12-month use, respectively (Government of Canada, 2018a). The Cannabis Act (Parliament of Canada, 2018) legalized non-medical cannabis use in Canada in October 2018. A primary objective of legalization was to protect public health and safety, including increased penalties for and awareness of the dangers of cannabis-impaired driving (CID) (Government of Canada, 2018b). In Canada, 4–12% of injuries or mortalities related to motor vehicle accidents (MVAs) may involve CID (Fischer, Imtiaz, Rudzinski, & Rehm, 2016). In 2012, the estimated costs of cannabis-attributed traffic collisions totalled CAD $1.1 billion, with the majority (60%) attributed to young people (Wettlaufer et al., 2017).

CID is a criminal offence in Canada (Government of Canada, 2018b) and recent legislation allows law enforcement that suspect drug-impaired driving to conduct the Standard Field Sobriety Test or demand an oral fluid sample to detect the recent presence of tetrahydrocannabinol (THC; the principle psychoactive constituent in cannabis) (Government of Canada, 2019). However, in 2014/2015, almost 1 in 5 grade 9–12 students reported riding with a cannabis-impaired driver (RCID), and grade 11–12 (i.e. driving-aged) students reported similar rates of driving after

using cannabis vs. drinking alcohol (∼9%) (Minaker et al., 2017). The Canadian Cannabis Survey (CCS) also found that prior to non-medical cannabis legalization, 39% of past-year cannabis users (aged $\geq$ 16) had engaged in past CID (Government of Canada, 2017; Government of Canada, 2018a). This is alarming given that CID is associated with a heighted risk of MVAs (Asbridge, Hayden, & Cartwright, 2012) and that young drivers (18–34 years) are already at a greater risk of death and injury from MVAs (Road Safety Canada Consulting, 2011).

Drunk-driving prevention campaigns have existed in Canada for decades (MADD Canada, n.d.), and government road-safety initiatives have been linked with a reduction in MVAs and fatalities (Road Safety Canada Consulting, 2011). Accordingly, whereas the national incidence of impaired driving violations has declined since the 1980s, that involving drugs has risen (Allen, 2016). Prevention efforts have focused on altering attitudes and beliefs towards alcohol impaired driving (AID); however, there has been a lack of public awareness regarding CID, and there is need for a national public educational strategy to address CID (Health Canada, 2016). Further, while other Canadian surveys report on the prevalence of CID (Government of Canada, 2017; University of Waterloo, 2018), there is little evidence of attitudes, beliefs or perceptions of risk towards CID vs. AID in Canada. International research suggests differing attitudes surrounding driving under the influence of licit vs. illicit drugs

(Malhotra, Starkey, & Charlton, 2017). Building upon the limited existing data regarding CID among young Canadians, the current study aimed to (1) examine the prevalence and risk perceptions of CID compared to AID among young people in Canada and (2) to identify at-risk groups by characterizing outcomes according to cannabis use status and demographic factors.

Methods

Participants and data source

The data for this cross-sectional study were collected in October 2017 as part of a national study on cannabis use. An online survey was administered to a national sample of respondents aged 16–30 years in Canada recruited via Léger's consumer web panel (Léger360, 2019), which consists of approximately 400,000 active members, half of them sampled using probability-based methods using the Canadian Census, and the remainder using other non-probability-based methods, including commercial surveys. Respondents aged 16–17 years were recruited through their parents (whose consent was obtained), and respondents aged 18–30 years were recruited directly. All participants provided informed consent and were compensated as per Léger's usual remuneration structure (including points, prize-based, and $2 rewards). This study received clearance from a University of Waterloo Research Ethics committee (ORE# 22392).

Prior to completing the survey, respondents viewed a message stressing the confidentiality of the survey responses and the importance of truthful reporting. At the end of the survey, participants were asked, 'Did you feel you were able to provide 'honest' answers about your marijuana use during the survey? ('No,' 'Some questions, but not all' or 'All questions'). Only participants who responded that they had reported honestly to 'all questions' were retained for analysis. Note that this paper uses the general term 'cannabis,' whereas survey questions referred to 'marijuana.' For clarification, the survey introduction stated, 'When we use the term marijuana or cannabis, this includes the dried herb, hashish, hash oil, wax or any other preparations of the plant commonly known as weed, pot, or ganja.'

Measures

Demographic variables included sex (female or male); age (recoded as 16–18, 19–24 and 25–30 years); and ethnicity (13 categories; recoded as 'White' or 'Other'). Education and income were not analyzed due to participant age (i.e. adolescents would not have finished their schooling and may not know their household income). Participants were asked, 'Have you ever tried marijuana?' ('Yes' or 'No') and 'Do you currently use marijuana?' ('Less than once per month,' 'Monthly,' 'Weekly' or 'Daily'). These items were combined to measure cannabis use status ('Never,' 'Less than monthly,' 'Monthly,' 'Weekly' or 'Daily').

CID behaviors were assessed using two questions from the 2014/2015 Canadian Tobacco, Alcohol and Drugs Survey (University of Waterloo, 2018): (1) 'Have you driven a vehicle (e.g. car, snowmobile, motor boat, or an off-road vehicle (ATV) within 2 h of using marijuana?' and (2) 'Have you ever been a passenger in a vehicle (e.g. car, snowmobile, motor boat, or an off-road vehicle (ATV) driven by someone who had been using marijuana in the last 2 h?' ('No, never,' 'Yes, in the last 30 days,' 'Yes, in the last 12 months' or 'Yes, more than 12 months ago').

Perception of risk from CID were assessed by asking participants, 'Do you think driving after using marijuana increases the risk of getting into an accident?' ('Not at all,' 'A little,' 'Somewhat' or 'A lot'). CID attitudes and beliefs were assessed using four questions: (1) 'How easy is it to tell if someone has used marijuana before driving?' ('Very easy,' 'Easy,' 'In the middle,' 'Difficult' or 'Very difficult'); (2) 'If a friend had used marijuana and was going to drive, would you try to stop them?' ('I wouldn't do anything, 'I would tell them not to drive, but I wouldn't try to stop them,' 'I would try a little bit to stop them from driving' or 'I would try very hard to stop them from driving'); (3) 'How likely do you think it is, that if a person drives after using marijuana, they will be stopped by the police?' and (4) 'If a person is stopped by the police after using marijuana, how likely are they to be charged?' (questions 3-4 scored as 'Extremely unlikely,' 'Unlikely,' 'In the middle,' 'Likely' or 'Extremely likely'). These questions were also asked relative to alcohol (see Figure 2).

Statistical analysis

A total of 1045 respondents completed the survey. Due to missing data on core measures of cannabis use ($n = 8$), deletions due to data integrity ($n = 62$), mobile device use ($n = 28$), or reported inability to honestly answer all survey questions ($n = 77$), 175 respondents were excluded, resulting in an analytic sample of 870 respondents (83.3%). Post-stratification sample weights (range: 0.5–5.0) were constructed based on 2017 population estimates from Statistics Canada's post-census CANSIM tables (Statistics Canada, 2019). For each age by sex by region group, weights were calculated as the population proportion divided by the sample proportion, ensuring the weighted sample aligned with known population proportions. Post-stratification weights calibrate the sample to be more representative of the population, allowing estimates to be corrected for bias in the sample (Groves et al., 2009). Weighted point estimates and analyses are reported throughout.

After removing 14 respondents who reported CID but no cannabis use, the denominator for the question on past CID became 856. Binary logistic regression models tested whether cannabis use status was associated with risk perceptions and behaviors related to CID after adjustment for age group, sex and ethnicity. Coding of risk behaviors for logistic regression models and reference variables is indicated beneath Tables 2 and 3. Spearman's rho (ρ) correlations (excluding 'Don't know' or 'Refuse') tested associations of CID behaviors and perceived risk of getting into an accident. Paired-samples t-tests compared mean responses to questions on perceptions of CID vs. AID (5-point scale, excluding 'Don't know'). Respondents were excluded from analyses on a case-wise

basis for measures with missing data. Data analysis was conducted using SPSS version 24.0 (IBM SPSS, Armonk, NY, USA). p Values <.05 were considered statistically significant.

Results

Table 1 shows the sample characteristics.

CID And RCID behaviors

As shown in Figure 1(a,b), 17.2% ($n = 147$) of respondents reported having ever engaged in CID (representing 33.5% ($n = 123$) of past-year cannabis users) and 40.7% ($n = 354$) of respondents reported RCID. Table 2 shows that compared to never users, all cannabis user groups were significantly more likely to report past CID and RCID. Females were significantly more likely to report RCID, and respondents aged 19–24 and 25–30 years were significantly more likely to report CID than those aged 16–18. Ethnicity was not associated with CID or RCID. Remaining contrasts for all regression models are available upon request.

Risk perceptions of CID

As shown in Figure 1(c), over a quarter (28%) of respondents believed that CID does not increase the risk of getting into an accident 'at all,' or that it does so only 'a little.' Table 2 shows that compared to never users, all cannabis user groups were significantly more likely to perceive little/no risk of
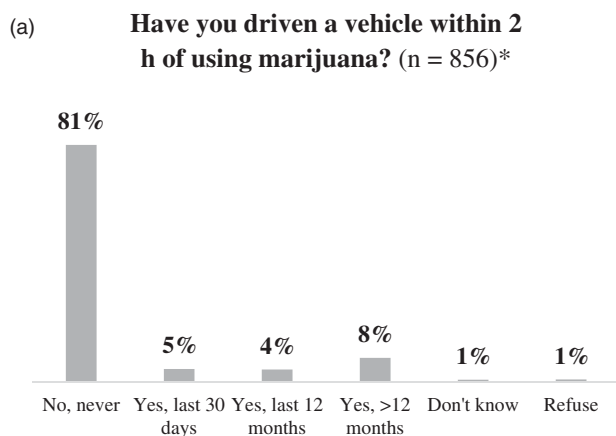
getting into an accident from CID. Sex, age and ethnicity were not significantly associated with this perception.
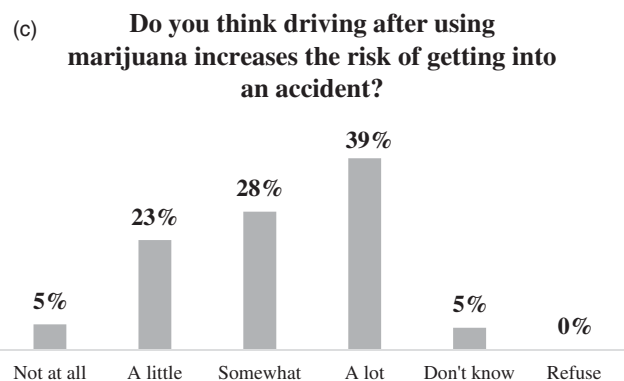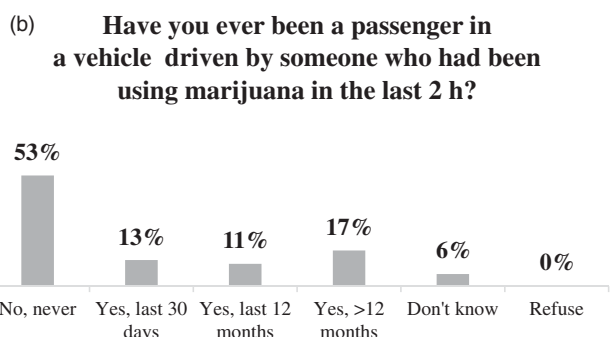
Attitudes and beliefs towards CID and AID

Figure 2 shows weighted frequencies for attitudes and beliefs towards CID and AID. Only 20% of respondents believed that it is 'easy' or 'very easy' to tell if a driver has used cannabis, less than half (43%) reported that they would 'try very hard' to stop a friend from CID, and 38% believed that a driver who had used cannabis (DUC) would be 'unlikely' or 'extremely unlikely' to be stopped by police.

Table 1. Sample characteristics of survey respondents ($n = 870$).

Variable	Unweighted % (n)	Weighted % (n)
Sex		
Female	52.1 (453)	49.2 (428)
Male	47.9 (417)	50.8 (442)
Age (years)		
16–18	25.2 (219)	17.0 (148)
19–24	30.7 (267)	40.3 (351)
25–30	44.1 (384)	42.7 (371)
Ethnicity		
White	64.5 (561)	64.6 (562)
Other	35.5 (309)	35.4 (308)
Cannabis use status		
Never user	41.5 (361)	37.4 (326)
< Monthly user	37.8 (329)	41.3 (359)
Monthly user	6.3 (55)	7.0 (61)
Weekly user	7.4 (64)	7.6 (66)
Daily user	7.0 (61)	6.7 (58)

(a) **Have you driven a vehicle within 2 h of using marijuana?** (n = 856)*

81% — No, never
5% — Yes, last 30 days
4% — Yes, last 12 months
8% — Yes, >12 months
1% — Don't know
1% — Refuse

*n = 856 for this item due to exclusion of 14 participants for poor data integrity.

(b) **Have you ever been a passenger in a vehicle driven by someone who had been using marijuana in the last 2 h?**

53% — No, never
13% — Yes, last 30 days
11% — Yes, last 12 months
17% — Yes, >12 months
6% — Don't know
0% — Refuse

(c) **Do you think driving after using marijuana increases the risk of getting into an accident?**

5% — Not at all
23% — A little
28% — Somewhat
39% — A lot
5% — Don't know
0% — Refuse

Figure 1. (a–c) Cannabis-impaired driving behaviours and perception of risk (% respondents; weighted frequencies; $n = 870$).

Table 2. Logistic regression results: cannabis-impaired driving behaviours and perceived risk ($n = 870$).

Variables	Have you driven a vehicle within 2 h of using marijuana?* (% yes, ever) ($n = 856$)	Have you ever been a passenger in a vehicle driven by someone who had been using marijuana in the last 2 h? (% yes, ever) % respondents[†], OR (95% CI), p-value	Do you think driving after using marijuana increases the risk of getting into an accident? (% not at all, a little, don't know)
Sex			
Female (ref)	15.1%, —ref—	44.2%, —ref—	30.3%, —ref—
Male	19.4%, 1.17 (0.77–1.79), $p = .46$	37.4%, 0.67 (0.49–0.93), **$p = .02$**	34.6%, 1.14 (0.83–1.56), $p = .41$
Age (years)			
16–18 (ref)	4.2%, —ref—	18.7%, —ref—	23.2%, —ref—
19–24	15.0%, 2.86 (1.10–7.41), **$p = .03$**	41.2%, 1.99 (1.16–3.42), **$p = .01$**	30.9%, 1.08 (0.67–1.77), $p = .75$
25–30	24.7%, 5.10 (1.99–13.03), **$p = .001$**	49.0%, 2.34 (1.37–4.01), **$p < .01$**	37.6%, 1.34 (0.82–2.19), $p = .24$
Ethnicity			
White (ref)	19.2%, —ref—	44.3%, —ref—	32.5%, —ref—
Other	13.7%, 0.83 (0.52–1.31), $p = .41$	34.2%, 0.87 (0.62–1.23), $p = .44$	32.4%, 1.25 (0.90–1.73), $p = .19$
Cannabis use status			
Never	n/a	10.2%, —ref—	17.2%, —ref—
< Monthly	17.9%, —ref—	53.8%, 8.51 (5.55–13.07), **$p < .001$**	34.5%, 2.51 (1.71–3.68), **$p < .001$**
Monthly	31.9%, 2.41 (1.30–4.47), **$p < .01$**	66.1%, 15.44 (8.05–29.63), **$p < .001$**	62.5%, 2.81 (1.54–5.14), **$p = .001$**
Weekly	44.0%, 4.37 (2.40–7.94), **$p < .001$**	65.7%, 17.62 (9.30–33.37), **$p < .001$**	45.9%, 4.02 (2.27–7.15), **$p < .001$**
Daily	59.2%, 7.18 (3.87–13.32), **$p < .001$**	59.2%, 25.57 (12.47–52.43), **$p < .001$**	85.1%, 27.19 (12.29–60.18), **$p < .001$**

CI: confidence interval; OR: odds ratio; ref: reference category

*$n = 856$ for this question, as 14 participants were excluded for poor data integrity. As this item did not apply to 'never users,' 'less than monthly users' was used as the reference variable for marijuana use status for this item only.

[†]% reporting the 'risky' behaviour, as indicated below each question. Significant contrasts ($p < .05$) compared to the reference variable are indicated in bold.

Table 3 shows correlates of CID attitudes and beliefs. Cannabis use status did not predict the ability to tell if a driver had used cannabis. When asked whether they would try to stop a friend from CID, compared to never users, all user groups were significantly more likely to report inaction. Most strikingly, 19.2% of never users reported that they would not stop a friend from CID or did not know how they would respond, compared to 68.4% of daily users. Compared to never users, weekly and daily users were significantly more likely to believe that a DUC was unlikely to be stopped by police, and weekly users were significantly more likely to believe that a DUC was unlikely to be charged. Neither sex nor age was significant; however, white respondents were significantly more likely to believe that a DUC was unlikely to be stopped by police.

Comparison of questions on CID vs. AID

Respondents found it significantly more difficult to tell whether a driver has used cannabis vs. alcohol before driving (3.11 (0.93) vs. 2.07 (1.15), $t(786) = 22.17$, $p < .001$) and reported a significantly lower likelihood of stopping a friend who had used cannabis vs. alcohol from driving (3.08 (1.02) vs. 3.83 (0.52), $t(807) = -21.56$, $p < .001$). Respondents also believed that a driver was less likely to be stopped by police or be charged after using cannabis compared to alcohol (2.83 (1.04) vs. 3.58 (1.04) $t(815) = -21.42$, $p < .001$; 3.77 (1.10) vs. 4.57 (0.93), $t(787) = -19.71$, $p < .001$, respectively).

Associations with risk perceptions

Perceived risk of getting into an accident from CID was inversely correlated with cannabis use status ($\rho = -0.41$, $p < .001$), past CID ($\rho = -0.27$, $p < .001$), RCID ($\rho = -0.29$, $p < .001$) and ability to tell if a driver has used cannabis ($\rho = -0.10$, $p = .001$). It was positively correlated with reported likelihood of stopping a friend from CID ($\rho = .44$, $p < .001$) and of a DUC being stopped by police ($\rho = 0.27$, $p < .001$) or being charged ($\rho = 0.23$, $p < .001$).

Discussion

Overall, about 17% of young people (16–30 years) in the current study reported having ever engaged in CID, comparable to 15% of Canadian high school students (Asbridge et al., 2012; Asbridge, Poulin, & Donato, 2005) and slightly higher than a sample of 17–39 year-olds in Scotland (11%) (Myant et al., 2006). Of past-year cannabis users, about 34% reported CID. This is slightly lower than the 39% reported in the CCS (Government of Canada, 2017; Government of Canada, 2018a), which examined a wider age range (≥ 16 years). Furthermore, over 2 in 5 young people (41%) reported RCID, comparable to the 31–39% reported in the CCS (Government of Canada, 2017; Government of Canada, 2018a), highlighting RCID as a risk to a substantial proportion of young Canadians.

Examining demographic differences, we found a significantly higher likelihood of past CID with age. This aligns with research reporting a higher frequency of CID and cannabis use among students in higher grades (Adlaf, Mann, & Paglia, 2003; Asbridge et al., 2012; Minaker et al., 2017), and is logical given that older age might provide more opportunities to use cannabis. Males reported a slightly higher overall frequency of past CID than females, consistent with previous research (Adlaf et al., 2003; Li, Simons-Morton, & Hingson, 2013); however, this sex difference was not statistically significant. Female respondents were, however, more likely than males to report RCID. In comparison, national student data indicated a higher likelihood of females to ride with an AID but not a CID (Minaker et al., 2017) and another study found no effect of sex for either behavior (Cartwright & Asbridge, 2011). Although we did not find a significant sex difference
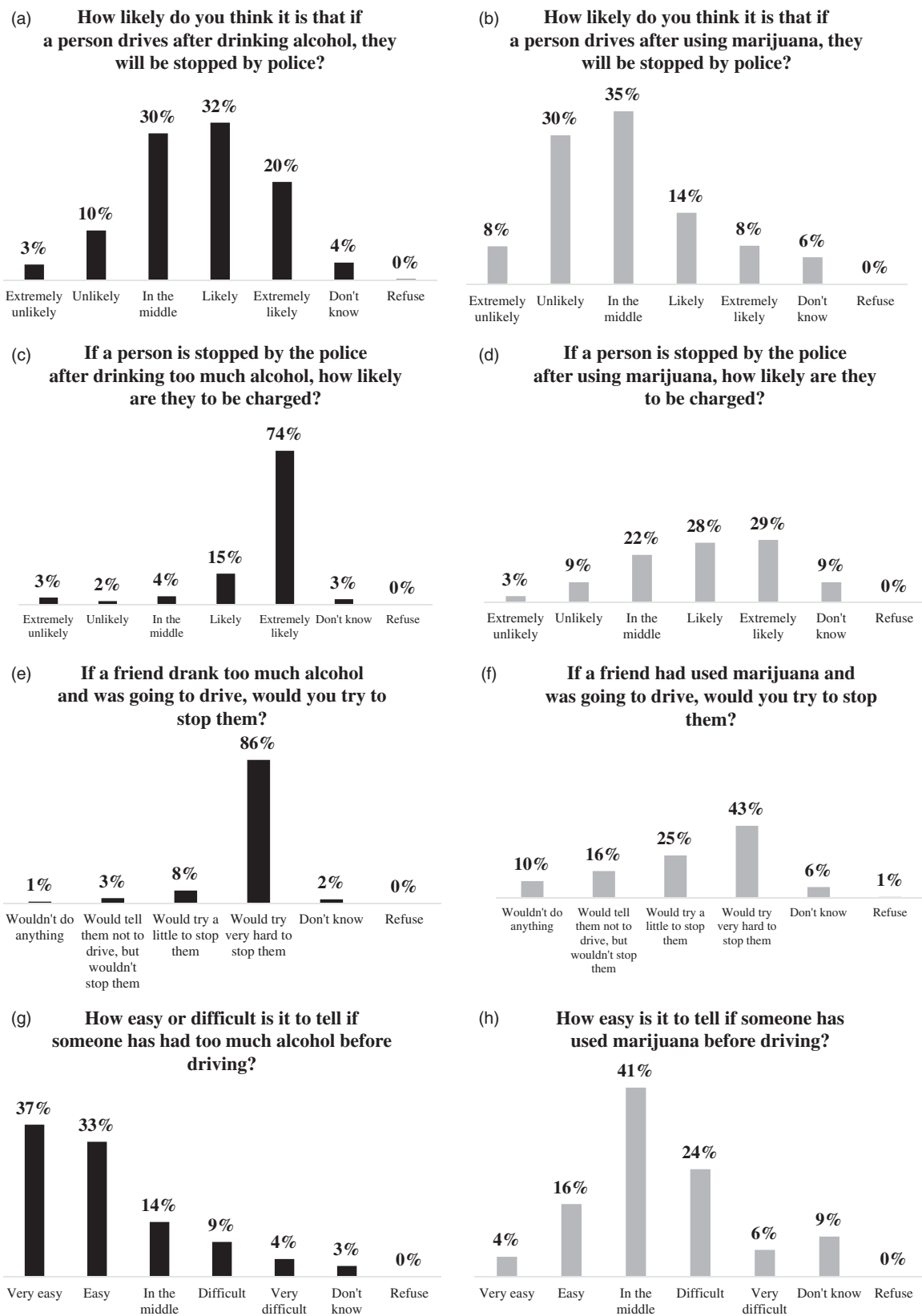
Figure 2. (a–h) Attitudes and beliefs towards cannabis- and alcohol-impaired driving (% respondents; weighted frequencies; $n = 870$).

in the perceived likelihood of getting into an accident after using cannabis, research from New Zealand found that males (aged 17–74) were more in agreement with the idea of driving after using illegal drugs than were females (Malhotra

et al., 2017), suggesting that perceptions may affect CID behaviors. Finally, white respondents were significantly more likely than other ethnicities to believe that a DUC is unlikely to be stopped by police, whereas ethnicity did not predict

Table 3. Logistic regression results: attitudes and beliefs towards cannabis-impaired driving ($n = 870$).

Variables	How easy is it to tell if someone has used marijuana before driving? (% very difficult, difficult, in the middle, don't know)	If a friend had used marijuana and was going to drive, would you try to stop them? (% do nothing, say something but don't try to stop them, don't know)	How likely do you think it is, that if a person drives after using marijuana, they will be stopped by the police? (% extremely unlikely, unlikely, in the middle, don't know)	If a person is stopped by the police after using marijuana, how likely are they to be charged? (% extremely unlikely, unlikely, in the middle, don't know)
		% respondents*, OR (95% CI), p-value		
Sex				
Female (ref)	81.2%, —ref—	28.8%, —ref—	79.3%, —ref—	41.4%, —ref—
Male	78.2%, 0.79 (0.56–1.11), $p = .18$	35.3%, 1.33 (0.98–1.80), $p = .07$	76.3%, 0.82 (0.59–1.14), $p = .23$	45.5%, 1.13 (0.86–1.49), $p = .39$
Age (years)				
16–18 (ref)	81.9%, —ref—	22.1%, —ref—	72.4%, —ref—	42.1%, —ref—
19–24	79.0%, 0.80 (0.48–1.33), $p = .39$	32.5%, 1.37 (0.85–2.21), $p = .20$	77.5%, 1.28 (0.81–2.05), $p = .29$	39.8%, 0.80 (0.53–1.21), $p = .29$
25–30	79.4%, 0.82 (0.49–1.37), $p = .44$	35.6%, 1.40 (0.87–2.27), $p = .17$	80.3%, 1.44 (0.90–2.31), $p = .13$	47.6%, 1.10 (0.73–1.66), $p = .64$
Ethnicity				
White (ref)	79.3%, —ref—	33.2%, —ref—	81.0%, —ref—	43.1%, —ref—
Other	80.4%, 1.14 (0.79–1.63), $p = .48$	29.9%, 0.97 (0.70–1.34), $p = .86$	71.9%, 0.63 (0.45–0.88), **$p < .01$**	44.3%, 1.14 (0.85–1.53), $p = .37$
Cannabis use status				
Never (ref)	79.1%, —ref—	19.2%, —ref—	71.9%, —ref—	37.8%, —ref—
< Monthly	78.2%, 1.00 (0.68–1.48), $p = 1.00$	35.4%, 2.19 (1.51–3.17), **$p < .001$**	77.5%, 1.12 (0.77–1.63), $p = .55$	44.8%, 1.35 (0.98–1.88), $p = .07$
Monthly	82.1%, 1.27 (0.62–2.60), $p = .51$	33.0%, 1.95 (1.06–3.58), **$p = .03$**	84.7%, 2.02 (0.96–4.28), $p = .07$	43.7%, 1.30 (0.74–2.29), $p = .36$
Weekly	80.3%, 1.19 (0.61–2.33), $p = .61$	44.9%, 3.10 (1.76–5.46), **$p < .001$**	92.6%, 4.66 (1.79–12.15), **$p < .01$**	57.8%, 2.28 (1.32–3.94), **$p < .01$**
Daily	88.5%, 2.22 (0.94–5.27), $p = .07$	68.4%, 8.47 (4.49–15.97), **$p < .001$**	88.8%, 2.67 (1.12–6.36), **$p = .03$**	51.5%, 1.71 (0.96–3.04), $p = .07$

CI: confidence interval; OR: odds ratio; ref: reference category
*% reporting the 'risky' behaviour, as indicated below each question. Significant contrasts ($p < .05$) compared to the reference variable are indicated in bold.

perceived likelihood of being charged. This perception may reflect overall trends in policing: visible minorities in Canada are disproportionately more likely to be stopped by police, whereas all racial groups receive similar proportions of charges following traffic stops (Foster, Jacobs, & Siu, 2016).

The current study also revealed important barriers to preventing CID among young people, which lends credence to previous research findings and highlights the need for increased public education. For one, the high prevalence of CID seems to reflect an inability to recognize cannabis impairment. Only 20% of young people reported finding it 'easy' or 'very easy' to tell if a driver has used cannabis, compared to 70% for alcohol. In the CCS, 16% of participants responded 'no' or 'don't know' when asked whether cannabis impairs one's ability to drive, and 24% reported not knowing how long after using cannabis it would be safe to drive (Government of Canada, 2017). Additionally, less than half of young people in our study reported that they would 'try very hard' to stop a friend from CID – 'half the proportion of those responding this way for' AID (43% vs. 86%, respectively). These differences between cannabis and alcohol behaviors likely reflect differing social norms and lower perceptions of risk regarding the extent to which cannabis impairs one's driving ability. Indeed, across survey items, young people reported that the risks related to driving after using alcohol were greater than those for cannabis. Similarly, in qualitative research, the majority of cannabis users believed that alcohol strongly impaired their driving but that cannabis did so only slightly (Terry & Wright, 2005). Also consistent with previous research reporting higher perceived legal consequences of AID compared to CID (Terry & Wright, 2005) or drug-impaired driving (Malhotra et al., 2017), young people in this study believed that drivers are less likely to be stopped and charged following CID compared to AID.

Collectively, these findings indicate a need for increased awareness of the risks and consequences of CID. Education

campaigns should dispel misunderstandings regarding the safety of driving after using cannabis (including the differing duration of impairment for various cannabis products [Cone, Johnson, Paul, Mell, & Mitchell, 1988]); highlight the risks of RCID; and teach young people to identify cannabis impairment among peers. Recent efforts on this front include a campaign by Drug Free Kids Canada which targets parents and youth using videos on CID (Drug Free Kids Canada, 2017), and the Government of Canada's mass media campaign on drug-impaired driving among youth (Government of Canada, 2018c). Given that cannabis impairment depends on individual-level factors, method of consumption, and potency, the Government of Canada currently offers no guidance to drivers surrounding how much cannabis can be consumed or how long to wait before driving (Government of Canada, 2019). Our results highlight the need for continued funding for education initiatives that offer concrete evidence regarding safe driving behaviors in the context of a legal cannabis market.

Finally, we found positive associations between perceived risk and legal consequences of CID and likelihood of stopping a friend from CID, as well as an inverse association of cannabis use status with certain outcomes. For instance, more frequent cannabis users perceived a lower risk of being stopped by police because of CID. Only 61% of cannabis users in the CCS believed that cannabis affects driving (Government of Canada, 2018a), yet Canadian high school students reporting past-year CID were over four times more likely than cannabis-free drivers to be involved in MVAs (Asbridge et al., 2012). Moreover, problem cannabis use and past CID have been identified as risk factors for RCID in young people (Cartwright & Asbridge, 2011). Altogether, these findings identify frequent cannabis use and low risk perceptions as risk factors for CID, RCID, and subsequent MVAs. Given that legal sanctions can successfully deter impaired driving (Goodwin et al., 2015), increasing the

perceived risk of legal consequences of CID may be an effective solution.

Strengths and limitations

This study was limited by its cross-sectional design, which precludes examination of the causal sequence of events, and by the use of non-probability sampling. Secondly, because we did not ask about past driving experience or at what age CID and RCID occurred, we cannot conclude that adolescents are less at risk than young adults (i.e. young adults reporting CID more than 12 months ago may have done so as adolescents). Future prospective studies should examine relative risk and/or likelihood of engaging in these behaviors over time. We did not assess alcohol intake or problem alcohol use as risk factors for AID or CID. This survey has not yet been validated, although several items were adapted from previous measures (e.g. Beirness & Beasley, 2011; Statistics Canada, 2016; University of Waterloo, 2018). Lastly, due to an oversight, a question on marijuana read, 'How easy is it to tell if someone has used marijuana before driving?', whereas the corresponding alcohol question read, 'How easy or difficult is it to tell … ?' However, given that findings indicated *more* difficulty determining whether a driver has used cannabis than alcohol, this typographical error does not seem to have biased participant responses. This study was novel in its ability to compare attitudes and beliefs of Canadian young people towards cannabis vs. alcohol. Additional study strengths include the use of a large commercial sample, and weighting to provide a more representative sample of Canadians aged 16–30 years.

Conclusion

This study found a high prevalence of CID and identified a number of potentially important barriers to reducing CID, beginning with perceived difficulties identifying when peers may be impaired and a reluctance to stop others from CID. CID was also associated with fewer perceived legal consequences than AID. These findings reinforce the importance of increasing the efficacy of roadside testing. In Ontario, the RIDE Checks program (RIDE Checks, 2018) has traditionally stopped vehicles to spot-check for AID. In November 2017, the program introduced a new campaign that will target younger drivers and emphasize the consequences of CID (Glover, 2017), which will be important in the context of cannabis legalization. In addition, recent legislative changes allow Canadian law enforcement to conduct random drug testing following a legal roadside stop (Government of Canada, 2019). Similar programs may be of value in other jurisdictions. Finally, most evidence and CID prevention initiatives to date have focused on adolescents (Drug Free Kids Canada, 2017; Government of Canada, 2018d); however, the current study found even higher rates of CID among young adults, consistent with higher rates of cannabis use among this age group (Government of Canada, 2018d). Effective public education and prevention initiatives should therefore target both adolescents and young adults.

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Data availability

The data associated with this study are available upon reasonable request to the corresponding author.

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