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Authors: Meghan Wrathall, Nick Cristiano, David Walters, & Andrew Hathaway

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At the Crossroads: Examining the Role of Place and Gender As Predictors of Cannabis Use-Related Driving Behaviour

Meghan Wrathall
University of Guelph
Guelph, Ontario, Canada
mwrathal@uoguelph.ca

Nick Cristiano
Trent University
Durham, Ontario, Canada
nickcristiano@trentu.ca

David Walters
University of Guelph
Guelph, Ontario, Canada
dwalters@uoguelph.ca

Andrew Hathaway
University of Guelph
Guelph, Ontario, Canada
hathawaa@uoguelph.ca

Abstract

Since cannabis was legalized in Canada in 2018, policy observers and researchers have devoted a great deal of attention to emerging trends and patterns and their implications for protecting health and safety. To inform this literature and policy discussions, this paper presents findings from a study that examines the relationship between place and gender in determining the likelihood of driving, and of being a passenger with someone who is driving, after using cannabis. Using 2019 data from the National Cannabis Survey, logistic regression analyses show that expected gender differences in self-reported driving after use of cannabis in larger urban centres were significantly smaller in rural parts of Canada. Our finding of no gender gap in less populated areas suggests there is a need for interventions more responsive to changing social norms in the legalization era that make women just as likely to take risks. Future harm reduction and educational initiatives would benefit from a better understanding of intersecting attributes of place and gender, informing services and programs attuned to the local needs of rural female populations.

Keywords: driving after using cannabis, impaired driving, cannabis legalization, rural Canada, harm reduction, gender

À la croisée des chemins : Examen du rôle du lieu et du genre en tant que facteurs prédictifs du comportement au volant lié à la consommation de cannabis

Résumé

Depuis la légalisation du cannabis au Canada en 2018, les observateurs et les chercheurs en matière de politique se sont penchés sur les tendances et les schémas émergents, ainsi que sur leurs implications pour la protection de la santé et de la sécurité. Afin d'éclairer ces travaux et les discussions politiques, cet article présente les résultats d'une étude qui examine le lien entre le lieu et le genre dans la probabilité de conduire, ou d'être passager d'une personne qui conduit, après avoir consommé du cannabis. À partir des données de 2019 de l'Enquête nationale sur le cannabis, des analyses de régression logistique montrent que les différences attendues entre les genres quant à la conduite déclarée après consommation de cannabis dans les grands centres urbains étaient significativement moins importantes dans les régions rurales du Canada. L'absence d'écart entre les genres dans les régions moins peuplées suggère la nécessité d'interventions mieux adaptées à l'évolution des normes sociales à l'ère de la légalisation, qui incitent les femmes à prendre autant de risques que les hommes. Les futures initiatives de réduction des préjudices et d'éducation gagneraient à mieux comprendre les propriétés croisées entre le lieu et le genre, ce qui permettrait d'adapter les services et les programmes aux besoins locaux des populations féminines en milieu rural.

Mots-clés : conduite après consommation de cannabis, conduite avec facultés affaiblies, légalisation du cannabis, Canada rural, réduction des préjudices, genre

1.0 Introduction

In October 2018, Canada legalized the production, sale, use, and supply of non-medical cannabis. Its public health approach to regulation implemented a number of priorities to address concerns for safety, including the prevention of driving after cannabis use (Amlung, 2018). Research has shown that cannabis impairs several cognitive and psychomotor functions critical to driving performance, including tracking skills, reaction times, and divided attention tasks (Hartman & Huestis, 2013). Although the evidence is mixed as to whether legalization has increased the prevalence of cannabis-involved driving, research shows an increasing likelihood of driving-related injuries, as well as finding higher rates in rural parts of Canada (cf. Brubacher et al., 2022; Gueye et al., 2023; Perreault, 2021; 2023).

The emerging base of knowledge suggests a need for closer monitoring and analysis of trends in cannabis-impaired driving to inform enforcement and prevention efforts (Gabrys & Wood, 2025). These objectives call for more attention to the influence of factors such as sex and gender, and to how they intersect with place. The present study builds directly on past research that observed a spike in self-reported driving after use of cannabis in rural parts of

Canada, not seen in urban areas, which returned to baseline one year after legalization (Wrathall et al., 2024). Being a passenger with someone driving after use of cannabis was just as commonly reported by women as men (Cristiano et al., 2023). To better understand the intersection between gender and place post-legalization using quantitative data, we conducted further statistical analyses informed, in part, by our review of the research literature below.

2.0 Impaired Driving in Rural Areas

Researchers have identified a variety of factors that may explain the higher rates of impaired driving in rural areas. Whereas these communities share common characteristics, like small population sizes and related challenges that hamper the development of needed public services, they are far from homogenous. Thus, a nuanced understanding of rural contexts is essential to planning policies and programs that meet the needs of rural residents. The community capitals literature identifies important differences in kind and supply of types of capital, which are interdependent and often influence each other (Emery & Flora, 2020; Halstead et al., 2022).

Deficiencies in *built* and *human* capital, for example, in rural communities are manifested in such problems as no public transportation as an alternative to driving, and few Drug Recognition Experts (DRE) to support enforcement efforts (cf. Pruitt, 2009; Robertson et al., 2016; Weisheit, 2020). Geographic isolation, or remoteness, also often impedes safer road design and is ordinarily associated with low detection rates of impaired driving and delayed emergency response times (Ward, 2007; Rakauskas et al., 2009). Influential forms of *cultural* and *social* capital, moreover, shape perceptions and behaviours in rural communities that normalize impaired and other risky forms of driving (Cox et al., 2017; Greene et al., 2018).

Fragmented *political* capital in rural areas makes it difficult to organize sustainable advocacy efforts that promote awareness of the harms of impaired driving (Robertson et al., 2017). Economic growth alone is not enough to be sustainable. Such initiatives require commitment to developing different kinds of capital—human, social, and political—often not in abundance in rural communities (Flora & Flora, 2016; Halstead et al., 2023). Addressing higher rates of impaired driving in these contexts requires a multipronged approach affording social factors as much consideration as inadequate resources and structural deficiencies that contribute to the problem.

Rural values foster pride in independence and self-reliance, traits that may discourage asking someone for a ride (Pruitt, 2009; Weisheit, 2020). These characteristics are supported by a well-entrenched car culture that stigmatizes use of public transportation and belittles those who do not drive (Breen & Sutherland, 2022; Hasan et al., 2022). There is also a perception that driving rural roads is safer, because of higher speed limits on highways, fewer vehicles and other hazards found in more congested areas (Charlton & Starkey, 2016; Cox et al., 2017).

Other research shows that normalization of impaired driving in rural areas is greater for use of cannabis than alcohol due to a lower perception of risk (Donnan et al., 2022; Greene et al., 2018). Intersecting structural and cultural risk factors observed in rural areas are evident as well in the research literature informing harm reduction. Developing prevention and educational initiatives requires a more systematic research focus on sexed and gendered perceptions and experiences of substance use-related forms of risk-taking behaviour.

3.0 Gender Differences in Impaired Driving

Gender plays a significant role in the use patterns and effects of psychoactive drugs like cannabis (Matheson & Le Foll, 2023). Predominant social norms, reinforcing heterosexist relational constructs of masculinity and femininity, often socialize men to engage in risk-taking behaviours like binge drinking, impaired driving, and speeding (Love et al., 2023; Cheah et al., 2010). Men perceive less risk and are more likely to report higher levels of sensation seeking, more dangerous driving, including driving under the influence of cannabis (Greaves & Hemsing, 2020).

Women have historically been viewed as representing a small proportion of drug users and drug use-related problems, with little need for specialized prevention and treatment (Blake et al., 2001). These outdated assumptions about substance use, including a typically male-centric perception of impaired driving, have led to a comparative neglect of the needs of women as an underserved and distinctive population. The resulting oversights are increasingly apparent in light of growing recognition that risk-taking among women is more often linked to mental illness and addiction, as well as higher prevalence of cannabis use for coping (Girgis et al., 2020; Webster, 2018, 2020).

Harm reduction policies and programs, it is argued, are well advised not to perpetuate the misinformed assumptions about gender they aim to address (Thomas & Bull, 2018). Such gendered stereotypes as those assuming women, for example, are only passive passengers taking rides with impaired drivers, disregard the ways in which they actively participate. Conversely, social norms and expectations placed on women sometimes drive perceptions that they are somehow more responsible for the irresponsible behaviour of men (Farrugia, 2017).

Researchers in Canada and the United States have long observed that young men in rural areas are more likely to drive impaired than their urban counterparts, reporting higher rates of substance use and risk-taking behaviour (cf. Cheah et al., 2010; Drixler et al., 2001; Spoth et al., 2001). Gender differences are often more pronounced in rural areas because boys have greater freedom and are less supervised than girls (Dunkley, 2004). Dominant constructions of rural spaces tend to be overly idealized as safe and peaceful places (Little, 2015; 2016) or depicted otherwise as being dull and backward, having not much else to do but get drunk and take drugs (Norman et al., 2011; Buck-McFadyen et al., 2019). Both constructions feature the same stereotypes of rural people as being more conservative, traditional, and having distinctly patriarchal gender roles.

The foregoing observations support the call for more geographically situated research on gendered social norms and attitudes toward impaired driving (Vanlaar et al., 2017) and driving after use of cannabis in the legalization era. In addition to more research, there is a need for more informed intersectional approaches to prevention, harm reduction, and educational initiatives tailored to the needs of women living outside urban centres. To better understand the relationship between place and gender as predictors of self-reported driving and being a passenger, after recent use of cannabis, we conducted the statistical analyses that follow.

4.0 Methods

4.1 Data

Using data from Statistics Canada's 2019 waves of the National Cannabis Survey (NCS),¹ we assessed the likelihood of driving within two hours after using cannabis, and of being a passenger in a vehicle where the driver had used cannabis within the previous two hours, by location and gender. The NCS is an anonymous, population-based survey administered by electronic questionnaire or computer-assisted interview to respondents aged 15 years or older, living in the ten provinces. The survey excluded people living on Indigenous reserves, institutionalized persons, and people experiencing homelessness, consisting of nine cross-sectional surveys administered at three-month intervals. The initial sample for each wave is approximately 6,000 respondents, stratified by province.

The data analyses, performed at Statistics Canada's Branch Research Data Centre at the University of Guelph, included both descriptive statistics and logistic regressions. There are two different subsamples, one for each analysis. Analysis 1 examined whether respondents had reported driving within two hours of using cannabis in the past three months. Those who reported they had not used cannabis in the past three months were omitted from the analysis, resulting in a final sample of 3,031 observations. For Analysis 2, being a passenger in a vehicle driven by someone who used cannabis in the past two hours, all respondents were included, resulting in a final sample of 18,403 observations.

4.2 Measures

The dependent variables captured whether a respondent reported driving a motor vehicle within two hours of using cannabis, and whether a respondent reported being a passenger of someone who had driven after using cannabis within the past two hours. The first of two key independent variables in each regression model series differentiated between respondents living in rural and non-rural parts of Canada. This variable was created by linking postal codes in the NCS to those in Postal Code Conversion File+ (PCCF+) that identify types of population centres. As such, our definition of rurality is population-based and presents a nationally representative sample.

Place of residence was coded as 1 (Non-Rural Area) or 2 (Rural Area), where a rural area consisted of any area outside of a population centre with less than 1,000 residents. Non-rural areas consisted of small, medium, and large population centres with over 1,000 residents. The second key independent variable is gender, which was coded 1 (males) and 2 (females).

¹The NCS includes nine survey waves, with waves 1 to 4 spanning the pre-legalization period and waves 5 to 9 gathered post legalization. Here our analyses concern waves 5 to 8, which were collected in February through December 2019. Wave 9 was excluded because it marks the onset of the COVID-19 pandemic, which presents a confound in interpreting the impact of legalization on cannabis use-related patterns of driving behaviour.

4.3 Analyses

Because both dependent variables have binary outcomes, we employed a series of logistic regressions² in which the order of predictor variables was determined and then added in a series of stages based on insights gathered from our literature review (Lewis, 2007). For each analysis, Model 1 examined the relationship between place of residence and the dependent variables (driving after using cannabis and being a passenger of someone who had driven after using cannabis).

Model 2 added the gender variable and Model 3 included sociodemographic variables controlled for in previous cannabis use and impaired driving literature (cf. Cristiano et al., 2023; Gueye et al., 2019; Myran et al., 2023). Model 4 included an interaction between place of residence and gender to determine if there was a differentiated impact on cannabis-impaired driving. Survey weights were used for all analyses to account for the complex sampling design of the NCS, non-response, and population characteristics, ensuring the results are representative of the target population. All statistical procedures were performed using STATA Version 15.

4.4 Limitations

There are some important limitations of this research that suggest a need for caution in interpreting results. The NCS is missing certain socio-demographic variables, such as race or ethnicity, that we could not control for in our models. Our study employed a binary male/female variable for gender, although we recognize that gender is not binary, but is rather a social construct that exists on a spectrum.³ Due to low case counts, however, we were unable to include those who identified as neither male nor female in our reporting of results.

Low case counts in the NCS for geographic residence also required us to employ a binary rural/non-rural category rather than a stratified rural/urban continuum. This choice seems justifiable considering our focus on rural patterns of behaviour as compared to those in other (non-rural) parts of Canada. Nonetheless, there are significant challenges presented by using arbitrary definitions of rurality that may differ markedly from other definitions used by other authors in our literature review. There is a need for extra caution, considering the variation in how rural is defined, when interpreting results.

² Logistic regression is a statistical model used when the dependent variable is binary. It estimates the odds that a certain outcome will occur based on other factors (Long & Freese, 2014).

³ Use of the term “sex” in social science research refers to biological attributes and mechanisms that are affected by, or affect, substance use in male and female bodies (Greaves & Hemsing, 2020). Our use of the term “gender” in this article refers to the socially and culturally constructed aspects of identity and social organization that shape expression, roles, norms, behaviours, relations, and institutional factors such as customs, regulations, and laws (Greaves & Hemsing, 2020; Matheson & Le Foll, 2023). While sex and gender are two distinct concepts, an intricate and dynamic relationship exists between sex and gender; and it is challenging to draw a line between them, since much research uses terms like sex and gender interchangeably or fails to differentiate their use in its analyses (DeKeseredy, 2015; Matheson & Le Foll, 2023). The results of our analyses are interpreted through a gender-focused lens to be consistent with the language in the NCS, and to be consistent with other social science research which views risk-taking behaviours as gendered practices (Butters et al., 2012; Greaves & Hemsing, 2020).

While no single definition of rurality exists, some common traits identified are small population size and residential density, geographic isolation, fewer social services and health supports. Other characteristics of rural communities include economic stagnation and decline, as well as having more patriarchal and conservative political leanings (Rennison & Mondragon, 2022). Since rural areas are far from homogenous, researchers use an array of definitions, different measurements and methods, each having its own pros and cons, with further implications for the interpretation and analysis of data.⁴

Additionally, the NCS relies on self-reports that may be biased due to inaccurate reporting, despite the guarantee of anonymity afforded that typically delivers reliable results (Harrison, 1995). But it has been well established that self-reported surveys are a better measure of impaired driving prevalence than relying on police or accident data (Junger-Tas & Marshall, 1999). Most importantly, the NCS is more representative of those who drive after using cannabis because few drivers actually come into direct contact with police (Brubacher et al., 2018; Cristiano et al., 2023).

5.0 Results

5.1 Descriptive Statistics

Descriptive statistics for both analyses are shown in Table 1. All variables were treated categorically. The sample size for Analysis 1 (those who had used cannabis in the past three months) was 3,031. Approximately 13% (n=386) of respondents reported driving after using cannabis, and 15% (n=464) reported living in a rural area. Almost half of respondents lived in the Province of Ontario, which is Canada's largest province. Approximately one-third of respondents were 25–34 years old, 60% identified as male, about half were married, and 40% single.

The education level of respondents was well distributed between those who attained high school or less (32%), trade certificate or diploma (40%), and university or higher education (28%). Nearly two-thirds were employed, and 40% of respondents made more than \$100,000 CAD per year. A third of the respondents reported having very good mental health, followed closely by those who said good (29%) or excellent (24%). Levels of cannabis use reported were evenly balanced between experimental (less than monthly), moderate (monthly or weekly), and daily (or almost daily) use.

⁴ Qualitative research prioritizes different standards of scientific rigour, for example, by representing lived experience through use of narrative definitions of rural residents themselves (cf. Hogg & Carrington, 2006; Owen & Carrington, 2015; Rennison & Mondragon, 2022). Interviewers and ethnographers seek to better understand how social meanings and identity are historically established, maintained and shaped through interaction in rural communities. This approach is advantageous for maintaining authenticity by capturing the richness and diversity of context or particularities of a rural research setting. A disadvantage of employing narrative definitions in qualitative research on rurality is that the research findings are not easily comparable nor generalizable to other rural areas cross-nationally, for example, as we have attempted using quantitative methods. An advantage of applying quantitative definitions, however arbitrary, are the insights gained by doing comparative statistical analysis of data on rural jurisdictions across Canada, allowing for relatively consistent interpretation of results.

The sample size for Analysis 2 (all respondents) was 18,403, with only 4% who reported having been a passenger with someone who had driven after using cannabis within two hours of cannabis use. Sixteen percent reported living in a rural area, and over one-third (39%) of respondents lived in the Province of Ontario. Fewer respondents were young adults, 25–34 years (19%) than in Analysis 1, compared to those who were 65 or older (20%). A lower proportion identified as male (49%), and more of them were married (63%), than those in Analysis 1.

The education level was evenly balanced between those who attained high school or less, a trade certificate or diploma, and university or higher education. Fewer were employed (54%), but the average personal income was about the same as those in Analysis 1. Slightly better mental health ratings were reported in Analysis 2, with 36% very good, 35% excellent, and 23% good mental health. The small minority who reported use of cannabis in this group (15%) was evenly divided between experimental, moderate, and daily cannabis users.

Table 1. *Sample Characteristics*

	Analysis 1 driven (n=3031)		Analysis 2 passenger (n=18403)	
	Frequency	Percentage	Frequency	Percentage
Outcome variables				
<i>Driven</i>				
No	2645	87%		
Yes	386	13%		
<i>Passenger</i>				
No			17621	96%
Yes			782	4%
Focal variables				
<i>Place of residence</i>				
Non-rural area	2567	85%	15522	84%
Rural area	464	15%	2881	16%
<i>Gender</i>				
Male	1846	61%	9106	49%
Female	1185	38%	9297	51%
Socio-demographic variables				
<i>Region</i>				
Atlantic	262	9%	1183	6%
Ontario	1263	42%	7180	39%
Quebec	492	16%	4287	23%
Prairies	579	19%	3266	18%
British Columbia	435	14%	2487	14%

Table 1 continued

<i>Age</i>				
15–24	547	18%	2185	12%
25–34	976	32%	3452	19%
35–44	598	20%	3090	17%
45–54	338	11%	2928	16%
55–64	363	12%	3131	17%
65+	209	7%	3618	20%
<i>Mental Health</i>				
Excellent	734	24%	6377	35%
Very good	1040	34%	6676	36%
Good	882	29%	4188	23%
Fair	311	10%	969	5%
Poor	64	2%	193	1%
<i>Marital Status</i>				
Married or common law	1586	52%	11534	63%
Divorced or separated	264	9%	2181	12%
Single	1181	39%	4688	25%
<i>Education</i>				
High school or less	977	32%	5856	32%
Trade certificate or college diploma	1219	40%	6258	34%
university or above	835	28%	6289	34%
<i>Employment</i>				
Paid work	1918	63%	9994	54%
School	255	8%	1367	7%
Not employed	82	3%	302	2%
Unpaid work	261	9%	1866	10%
Retired and other	515	17%	4874	26%
<i>Level of Cannabis Use</i>				
Never				85%
Experimental	969	32%	15548	5%
Moderate	1057	35%	914	5%
Daily	1006	33%	973	5%
<i>Personal Income</i>				
Less than \$40000	519	17%	3730	20%
\$40001–60000	433	14%	2867	16%
\$60001–80000	406	13%	2790	15%
\$80001–100000	472	16%	2533	14%
More than \$100000	1200	40%	6483	35%

*Numbers and percentages are rounded, so they may not equal 100.

5.2 Driving After Using Cannabis

Table 2 provides the logistic regression estimates that predicted the likelihood of driving after using cannabis for those who used cannabis within the previous three months. Model 1, which examined the relationship between driving after using cannabis and place of residence, showed a significant difference between rural and non-rural respondents. Rural residents were more likely to report driving after using cannabis ($p < 0.05$). Model 2, which examined the relationship between place of residence, gender and driving after using cannabis, revealed that rural residents were significantly more likely to drive than non-rural residents ($p < 0.05$), and that females were less likely to drive than males ($p < 0.00$).

In Model 3, which included socio-demographic variables, group differences by gender remained significant ($p < 0.00$). Rural residents are still found to drive at higher rates than non-rural residents, but group differences were no longer statistically significant ($p < 0.06$). Respondents from British Columbia were more likely to drive after using cannabis than those living in Atlantic Canada ($p < 0.05$), and those with a trades or college diploma were more likely to drive after using cannabis ($p < 0.05$) than those with a high school diploma. Not surprisingly, respondents who reported using cannabis more frequently were also more likely to drive after using ($p < 0.00$). The effects of the remaining control variables were not statistically significant.

Table 2. *Logistic Regression Predicting Driving After Using Cannabis, NCS Wave 5,6,7,8 (n=3031)*

	Model 1		Model 2		Model 3		Model 4	
	Odds	SE	Odds	SE	Odds	SE	Odds	SE
Focal variables								
<i>Place of residence</i>								
Non-rural area	Ref.		Ref.		Ref.			
Rural area	1.50*	0.31	1.51*	0.31	1.63†	0.41		
<i>Gender</i>								
Male			Ref.		Ref.			
Female			0.51***	0.09	0.56***	0.11		
Socio-Demographic Variables								
<i>Region</i>								
Atlantic					Ref.		Ref.	
Ontario					1.22	0.28	1.25	0.29
Quebec					1.72†	0.48	1.79*	0.51
Prairies					1.49†	0.31	1.53*	0.32
British Columbia					1.70*	0.44	1.72*	0.44
<i>Age</i>								
15–24					Ref.		Ref.	
25–34					1.23	0.53	1.21	0.52
35–44					0.93	0.41	0.92	0.41
45–54					0.62	0.32	0.63	0.32
55–64					0.89	0.48	0.87	0.47
65+					0.44	0.30	0.43	0.29

Table 2 continued

<i>Marital Status</i>								
Married or common law				Ref.				Ref.
Divorced or separated				1.02	0.28		1.02	0.28
Single				0.75	0.17		0.75	0.17
<i>Education</i>								
Highschool or less				Ref.				Ref.
Trade certificate/college diploma				1.92**	0.46		1.94**	0.47
University or above				1.49	0.39		1.52	0.40
<i>Employment</i>								
Paid work				Ref.				Ref.
School				0.88	0.47		0.85	0.47
Not employed				0.33†	0.19		0.32*	0.19
Unpaid work				0.56	0.21		0.55†	0.20
Retired and other				1.43	0.45		1.45	0.46
<i>Level of cannabis use</i>								
Experimental				Ref.				Ref.
Moderate				6.62***	2.56		6.51***	2.52
Daily				30.07***	10.92		29.99***	10.86
<i>Personal income</i>								
Less than \$40000				Ref.				Ref.
\$40001-60000				0.63	0.20		0.79	0.24
\$60001-80000				0.80	0.24		0.75	0.27
\$80001-100000				0.74	0.27		0.75	0.24
More than \$100000				0.76	0.24		0.79	0.24
<i>Mental health</i>								
Excellent				Ref.				Ref.
Very Good				1.21	0.32		1.21	0.32
Good				1.31	0.36		1.33	0.36
Fair				1.43	0.54		1.40	0.53
Poor				1.50	0.72		1.52	0.73
Interaction								
<i>Place of residence*gender</i>								
Non-rural area*male								Ref.
Non-rural area*female							0.47***	0.10
Rural area*male							1.24*	0.40
Rural area*female							1.35	0.46
Constant	0.14	0.01	0.17	0.09	0.01	0.01	0.01	0.01

Note: †p <= .10. * p <= .05. ** p <= .01. *** p < .001.

Model 4, which examined the interaction between place of residence and gender, on whether the respondents reported driving after using cannabis, showed that the interaction was statistically significant ($p < 0.01$). For ease of interpretation, the estimates for these variables from Model 4 were converted into predicted probabilities (see Figure 1). The predicted probabilities were obtained by holding the control variables constant at typical values. Proportions were used for all variables.

Figure 1: Probability of driving after using Cannabis.

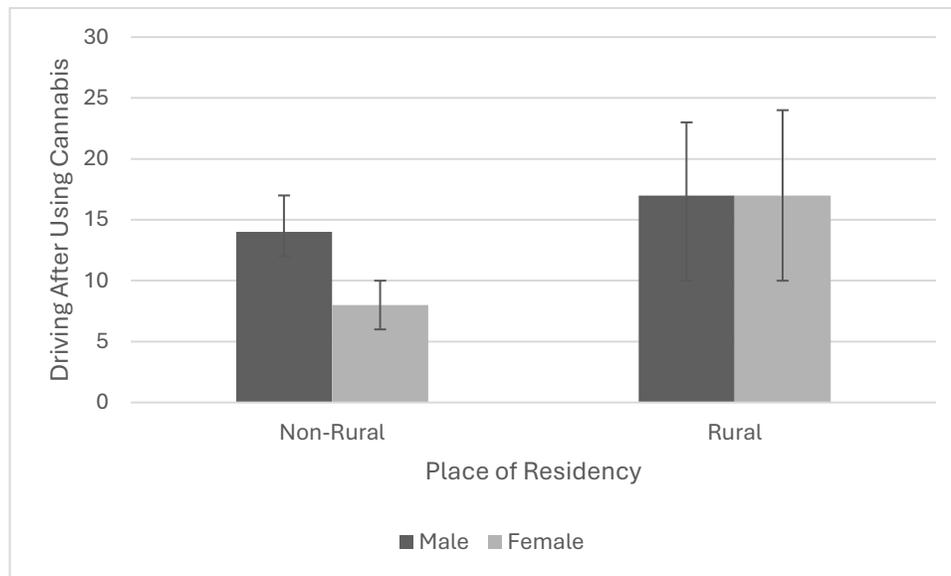


Figure 1 shows that non-rural males (14%, 95% CIs: 12, 17) were significantly more likely to drive than non-rural females (8%, 95% CIs: 6, 10). The likelihood for rural males (17%, 95% CIs: 10, 23) and rural females (17%, 95% CIs: 10, 25) of having driven after using cannabis, however, was the same.

5.3 Being a Passenger with Someone Driving After Using Cannabis

Table 3 provides the estimates of being a passenger with someone who was driving after using cannabis. Model 1, which examined the relationship between being a passenger and place of residence, showed that the differences observed were not statistically significant. Model 2, which examined the relationship between being a passenger, place of residence, and gender, revealed that place of residence remains non-significant, and that females were significantly less likely to be a passenger than males ($p < 0.05$). In Model 3, which included selected socio-demographic variables, place of residence continued to have no significant impacts, and gender became non-significant.

The introduction of socio-demographic control variables showed that the likelihood of being a passenger with someone who has driven after using cannabis significantly decreased with age, and that those living in Ontario were less likely to be a passenger than those living in Atlantic Canada ($p < 0.05$). As the frequency of use increased so did the odds of being a passenger with someone driving after using cannabis ($p < 0.01$). The effects of the remaining control variables were not statistically significant. Model 4, which included the interaction term between place of residence and gender, did not reveal any significant differences by gender, with the model

predicting 4% of males and females from both non-rural and rural areas to ride as passengers in vehicles with drivers who had recently used cannabis.

Table 3. *Logistic Regression Predicting Being a Passenger With Someone Driving after Using Cannabis, NCS Wave 5,6,7,8 (n=18403)*

	Model 1		Model 2		Model 3		Model 4	
	Odds	SE	Odds	SE	Odds	SE	Odds	SE
Focal Variables								
<i>Place of residence</i>								
Non-rural area	Ref.		Ref.		Ref.			
Rural area	0.90	0.15	0.91	0.15	1.03	0.17		
<i>Gender</i>								
Male			Ref.		Ref.			
Female			0.75*	0.09	1.03	0.15		
Socio-Demographic Variables								
<i>Region</i>								
Atlantic					Ref.		Ref.	
Ontario					0.70*	0.13	0.71*	0.13
Quebec					1.11	0.19	1.11	0.19
Prairies					0.84	0.14	0.84	0.14
British Columbia					1.11	0.23	1.11	0.23
<i>Age</i>								
15–24					Ref.		Ref.	
25–34					0.79	0.19	0.79	0.19
35–44					0.55*	0.14	0.55*	0.14
45–54					0.32***	0.09	0.32***	0.09
55–64					0.20***	0.06	0.20***	0.06
65+					0.10***	0.04	0.10***	0.04
<i>Marital Status</i>								
Married or common law					Ref.		Ref.	
Divorced or separated					1.07	0.26	1.07	0.26
Single					1.19	0.20	1.19	0.20
<i>Education</i>								
Highschool or less					Ref.		Ref.	
Trade certificate/college diploma					1.12	0.18	1.12	0.18
University or above					0.73†	0.13	0.73†	0.13
<i>Employment</i>								
Paid work					Ref.		Ref.	
School					0.86	0.26	0.86	0.26
Not employed					1.24	0.45	1.24	0.45
Unpaid work					1.20	0.25	1.20	0.25
Retired and other					1.41	0.33	1.41	0.33

Table 3 continued

<i>Level of Cannabis Use</i>								
Never					Ref.			
Experimental					6.04***	1.33	6.04***	1.33
Moderate					12.09***	2.30	12.09***	2.30
Daily					18.71***	3.46	18.71***	3.46
<i>Personal Income</i>								
Less than \$40000					Ref.		Ref.	
\$40001–60000					0.81	0.18	0.81	0.18
\$60001–80000					0.71	0.16	0.71	0.16
\$80001–100000					0.85	0.19	0.85	0.19
More than \$100000					0.83	0.18	0.83	0.18
<i>Mental Health</i>								
Excellent					Ref.		Ref.	
Very good					0.92	0.15	0.92	0.15
Good					0.80	0.15	0.80	0.15
Fair					1.40	0.39	1.40	0.39
Poor					1.02	0.54	1.02	0.54
Interaction								
<i>Place of residence*gender</i>								
Non-rural area*male							Ref.	
Rural area*male							1.03	0.16
Non-rural area*female							1.01	0.23
Rural area*female							1.09	0.26
Constant	0.05	0.00	0.05	0.00	0.04	0.02	0.04	0.02

Note: †p <= .10. * p <= .05. ** p <= .01. *** p < .001.

6.0 Discussion

The results corroborate past research indicating no gender difference in the likelihood of being a passenger with someone who had driven after using cannabis. This finding is interpreted as signalling a need for greater focus on developing educational initiatives recognizing risk as gendered, and more services tailored to addressing the distinctive needs of women. Our finding of no gender gap in the prevalence of driving after use of cannabis in rural areas alone is further indicative of place-based patterns of behaviour that contradict assumptions about gender norms and roles. In addition to deficiencies in built and human capital explaining higher prevalence of rural impaired driving, there are an array of contributing factors, including a car culture, for men and women of all ages, in which driving itself is a more common recreational activity (cf. Buck-McFayden et al., 2019; Greene et al., 2018; Robertson et al., 2017).

The lack of place and gender informed services, more generally, suggests a need for harm reduction and prevention messaging that addresses substance use and gender norms, including structural and cultural factors reinforcing harmful stigmas, stereotypes, and patterns of behaviour (cf. Greaves & Hemsing, 2020; Hemsing & Greaves, 2020; Pruitt, 2009). Rural women, in particular, are “transit

disadvantaged” (Breen & Sutherland, 2022, p. 176). Having less access to public transportation increases both their risk of impaired driving and accepting rides from others who should not be driving. Concern for personal safety and pervasive gender stereotypes disproportionately affect the options available to women. Providing real alternatives to driving is essential for designing programs sensitive to place- and gender-based concerns.

Perpetuating myths that female passengers are passive victims, or that females are responsible for decisions made by males, are conveyed and reproduced in many educational practices. Providing balanced information, eschewing heteronormative and binary assumptions about femininity and masculinity, requires that women’s needs, perspectives, and experiences be properly considered in the development of programs. To ensure that programming is place-based, there must be particular attention to resources and deficiencies identified in community capital in developing initiatives that target impaired driving in rural communities.

Developing sustainable built capital is critical for improving public transportation, and human capital, for bringing in more expertise and training opportunities. These kinds of projects, nonetheless, may not be realistic, considering the all-too-common scenario of shrinking budgets for government investments in all kinds of social programs. In these circumstances of a shortfall in resources, other forms of intervention might be called on more immediately as less costly measures that help reduce known harms. Recognizing their diversity, no matter how remote, rural communities have resources that can be transformed into capital with value for addressing and meeting local needs (Flora & Flora, 2016; Halstead et al., 2022).

More workable and cost-efficient options for addressing deficiencies identified might focus on developing social and cultural capital by leveraging community relationships and networks to foster harm-reducing change in social attitudes and norms. The normalization of impaired driving in rural communities calls for more investment in youth education programs that seek to reshape harmful behavioural norms of risk-taking through intergenerational learning (Wrathall & Herron, 2021). Such programs have the benefit of utilizing capital that already exists in schools, which are a crucial source of contact, at the centre of communities for rural youth and parents.

School-based prevention, education, and advocacy efforts are affordable, effective ways to address cannabis-impaired driving in ways that are suitably gender informed (Cristiano et al., 2023). Greaves and Hemsing (2020), for example, cite research showing that sex differences may impact levels of impairment, with females tending to experience greater subjective effects at lower doses and with a lower blood level of THC than males (Matheson et al., 2020). There is a need for further study to corroborate this finding and its implications for use of cannabis when driving. Further evidence suggesting that women may require more time after using to be considered safe to drive might be used, however, to inform more precise and refined harm reduction guidelines (much like alcohol) for cannabis.

Aligning educational initiatives for women with community resources and distinctive local values can foster more sustainable efforts to address the increasing prevalence of risk-taking behaviour. More qualitative research, such as Webster’s (2018; 2020), for example, is essential for informing interventions based on a better understanding of the experiences and circumstances of rural female impaired-driving offenders. Studies like these fill important existing gaps in knowledge to improve prevention efforts for at-risk youth and young adults.

In light of evidence suggesting that the gender gap in cannabis use prevalence has been closing for at least two decades (Matheson et al., 2025), more work is needed that examines temporal trends in gender differences in driving after recent use of cannabis. Other future avenues of research call for closer attention to such variables as public transportation, which are not uniformly distributed nor absent in all areas considered rural (or non-rural). Research conceptualizing and operationalizing other definitions of rurality, such as a narrative definition often employed in qualitative research (Rennison & Mondragon, 2022), would be useful in exploring potential differences between rural communities. A better understanding of the influence of gender and related place-based contexts that present the greatest risk is increasingly important for addressing the emerging public health and safety burdens of legalizing cannabis and potential changes in the laws for other drugs.

7.0 Conclusion

This study contributes to the existing base of knowledge on the relationship between place and gender as predictors of cannabis use-related driving behaviour. The gender gap in the prevalence of risk taking appears to be showing signs of closing, in rural areas in particular. Prevention messaging addressing risks of cannabis-impaired driving has, predictably, neglected concerns unique to rural areas. Existing structural constraints and social norms must be considered among the host of localized conditions faced by residents when implementing harm reduction informed policies and programs.

Initiatives designed for urban dwellers, understandably, neglect the needs of those in smaller centres, and outside them, with less access to resources based on built and human capital. Lack of funding in these areas underscores the need to foster health-promoting cultural and social forms of capital through educational initiatives that challenge well-established, harmful gender stereotypes and patterns of behaviour. Rural female residents of all ages must be actively consulted and involved in the development of harm reduction programs that meet the needs of small communities where complex place and gender characteristics intersect.

Disclosure statement

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