



## Training/Practice Health Policy and Promotion

# The Risk of Cardiovascular Events on Cannabis' Highest Day

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### ABSTRACT

Knowledge of the acute cardiovascular effects of cannabis consumption remains largely unknown and is important given the changing landscape of legalization of recreational cannabis use. “4/20” is an annual event where many individuals gather to consume cannabis. An increased risk of adverse health events such as motor vehicle accidents has previously been reported to occur on “4/20.” In this study, population-based administrative databases in Ontario, Canada, were used to evaluate the association between “4/20” and cardiovascular events. An increased risk of cardiovascular events on a population level was not observed on “4/20.” Additional research into the changes in the prevalence of the use of cannabis with recreational legalization and acute and chronic risk with cannabis use is suggested.

### RÉSUMÉ

La connaissance des effets cardiovasculaires aigus de la consommation de cannabis est largement méconnue, mais elle est importante dans le contexte évolutif de la légalisation de l'usage du cannabis à des fins récréatives. Le 4/20 est un événement annuel où de nombreux amateurs se rassemblent pour consommer du cannabis. Un risque accru d'incidents ayant des conséquences négatives sur la santé, comme les accidents de la route, a déjà été signalé dans le cadre du 4/20. Dans cette étude, les chercheurs ont utilisé des bases de données administratives fondées sur la population de l'Ontario, au Canada, pour évaluer l'association entre le 4/20 et les événements cardiovasculaires. Aucun risque accru d'événements cardiovasculaires n'a été observé au sein de la population dans le cadre du 4/20. Il est recommandé d'effectuer d'autres études sur l'évolution de la prévalence de l'usage du cannabis dans le contexte de la légalisation à des fins récréatives et sur les risques aigus et chroniques liés à l'usage du cannabis.

Cannabis is the world's most commonly used “illicit” drug.<sup>1</sup> In North America, approximately 8% of individuals 15 to 64 years of age reported cannabis use in the last year.<sup>1</sup> It is expected that cannabis use will continue to increase in North America with the shifting landscape of legalization for recreational purposes and with this will come potential unintended health consequences.

The cardiovascular effects of marijuana remain largely unknown with current research limited by suboptimal study design including inadequate assessment of exposure.<sup>2</sup> April 20 or “4/20” is an annual event where cannabis enthusiasts gather to celebrate and partake in the use of cannabis. In Ontario, Canada, thousands of individuals gather and consume cannabis at many locations making it ideal to study the population-level risk of cardiovascular events associated with

acute cannabis consumption. Herein, we report on the population-level risk of all cardiovascular events on “4/20” in Ontario, Canada.

### Methods

Population-based databases collected by the Canadian Institute for Health Information were employed to determine emergency department (ED) visits with a main diagnosis of cardiovascular disease (International Classification of Diseases, 10th [ICD-10] revision codes: I00-I78) for 10 consecutive (2008–2017) “4/20” days in Ontario, Canada. These data sets were linked using unique encoded identifiers and analyzed at ICES. The use of data in this project was authorized under section 45 of Ontario's Personal Health Information Protection Act, which does not require individual consent or research ethics board review.

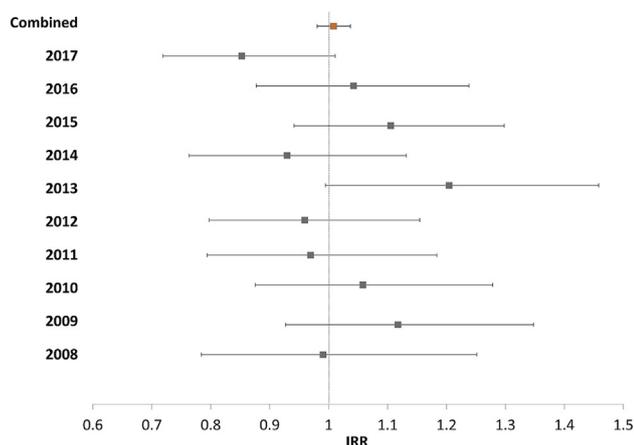
All Ontarians were included except those <18 and >80 years or residing in a long-term care facility. The number of cardiovascular events on April 20 of each year in the study period was compared with the average number of events on control days 1 week prior (April 13) and 1 week subsequent (April 27) to April 20 to determine the incidence rate ratio (IRR) and 95% confidence interval (CI). This approach

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**Figure 1.** Incident rate ratio (IRR) for cardiovascular events on “4/20.” The incidence of emergency department visits per 1,000,000 Ontarians due to any cardiovascular diagnosis was determined for each “4/20” day between 2008 and 2017. The IRR was determined by comparing the rate of events on “4/20” with the mean of events occurring 1 week prior and 1 week subsequent to “4/20.” The yearly IRR and 95% confidence interval for each year of the 10-year study period is displayed. A pooled estimate of the IRR was determined using a random effects model.

adjusts for known seasonal and weekday variation in cardiovascular events. Events only on April 20, and not the days subsequent, were studied as a prior report suggested that the highest risk of cardiac events such as myocardial infarction occurs within 60 minutes of cannabis consumption,<sup>3</sup> and cannabis consumption typically occurs around 4:20 PM on each “4/20” celebration. The IRR for each year was then pooled using a random effects model to determine the overall IRR for the 10-year study period.

Subgroup analysis limiting the cohort to individuals <45 years was performed as the majority of Canadian marijuana users are <45 years.<sup>4</sup> The analyses were also repeated limiting to urban ED visits. A sensitivity analysis using nonspecific cardiovascular diagnostic codes (ICD-10: R000-R002, R008, R060, R064, R068, R071-R074, R42) was performed to ensure that true cardiovascular events were not miscoded in administrative databases resulting in an underestimation of the primary endpoint. The IRR for cannabis-related ED visits (ICD-10: F120-F129, T407) and ED visits for any diagnosis on “4/20” were determined to provide context to the primary analysis. Two-tailed *P* values <0.05 were considered significant. Analyses were performed with SAS software, version 9.4 (SAS Institute, Cary, NC).

## Results

The mean incidence of any cardiovascular event on “4/20” during the 10-year study period was 15.9 per 1,000,000 Ontarians and 15.6 events per 1,000,000 Ontarians 1 week prior and subsequent to “4/20.” The incidence of cardiovascular events remained stable during the study period. **Figure 1** highlights the IRR for each year during the 10-year study period. The relative incidence of any cardiovascular event over the 10-year study period was 1.01 (95% CI, 0.98-1.04).

The results were similar regardless of the type of cardiovascular event (atrial fibrillation IRR = 0.99, 95% CI, 0.94-1.03; heart failure IRR = 1.04, 95% CI, 0.99-1.10; myocardial infarction IRR = 0.96, 95% CI, 0.92-1.01; ischemic stroke IRR = 0.95, 95% CI, 0.90-1.00). The results were also similar in individuals <45 years (IRR = 1.02, 95% CI, 0.95-1.10) and ≥45 years (IRR = 1.01, 95% CI, 0.98-1.04), in urban (IRR = 1.01, 95% CI, 0.97-1.05) and rural EDs (IRR = 1.01, 95% CI, 0.95-1.07), and when nonspecific cardiovascular diagnostic codes were used (overall: IRR = 0.99, 95% CI, 0.98-1.01; <45 years: IRR = 1.00, 95% CI, 0.98-1.02; ≥45 years: IRR = 0.99, 95% CI, 0.98-1.01; urban EDs: IRR = 0.99, 95% CI, 0.97-1.01; rural EDs: IRR = 1.00, 95% CI, 0.96-1.04).

The mean incidence of cannabis-related ED visits on “4/20” during the 10-year study period was 5.5 per 1,000,000 Ontarians and 2.6 events per 1,000,000 Ontarians 1 week prior and subsequent to “4/20.” Cannabis-related ED visits were significantly increased on “4/20” (IRR = 1.41, 95% CI, 1.20-1.67). All-cause ED visits were not increased on “4/20” (IRR = 0.99, 95% CI, 0.99-1.00).

## Discussion

The findings of this ecological study suggest that acute cannabis consumption may not be associated with an increase in cardiovascular events on a population level. Although this work is limited by the ability to identify individual cannabis use thereby preventing the determination of personalized risk with acute cannabis consumption, the findings are noteworthy as knowledge of the overall population-level impact of acute cannabis consumption will be of importance to policy makers and health care planners in light of the recent legalization of recreational cannabis use in Canada and 10 states and the District of Columbia in the United States. Although some may question the applicability of these findings as they were derived in the era before legalization of recreational cannabis, it remains unclear whether cannabis use will increase further when recreational legalization occurs.<sup>5</sup> As both the prevalence of use and magnitude of an individual’s risk with any exposure contribute to its population attributable fraction, future research evaluating changes in the prevalence of cannabis use with recreational legalization and risks associated with acute and chronic cannabis consumption is necessary. Indeed, research in this vane may be eased with legalization of recreational cannabis use.

## Conclusion

An increased rate of cardiovascular events was not observed on “4/20.” Additional work to confirm these findings and assess for changes in time with legalization of recreational marijuana is strongly encouraged.

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### **Disclosures**

The authors have no conflicts of interest to disclose.

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