

## Substituting cannabis for prescription drugs, alcohol and other substances among medical cannabis patients: The impact of contextual factors

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### Abstract

**Introduction and Aims.** Recent years have witnessed increased attention to how cannabis use impacts the use of other psychoactive substances. The present study examines the use of cannabis as a substitute for alcohol, illicit substances and prescription drugs among 473 adults who use cannabis for therapeutic purposes. **Design and Methods.** The Cannabis Access for Medical Purposes Survey is a 414-question cross-sectional survey that was available to Canadian medical cannabis patients online and by hard copy in 2011 and 2012 to gather information on patient demographics, medical conditions and symptoms, patterns of medical cannabis use, cannabis substitution and barriers to access to medical cannabis. **Results.** Substituting cannabis for one or more of alcohol, illicit drugs or prescription drugs was reported by 87% ( $n = 410$ ) of respondents, with 80.3% reporting substitution for prescription drugs, 51.7% for alcohol, and 32.6% for illicit substances. Respondents who reported substituting cannabis for prescription drugs were more likely to report difficulty affording sufficient quantities of cannabis, and patients under 40 years of age were more likely to substitute cannabis for all three classes of substance than older patients. **Discussion and Conclusions.** The finding that cannabis was substituted for all three classes of substances suggests that the medical use of cannabis may play a harm reduction role in the context of use of these substances, and may have implications for abstinence-based substance use treatment approaches. Further research should seek to differentiate between biomedical substitution for prescription pharmaceuticals and psychoactive drug substitution, and to elucidate the mechanisms behind both. [Lucas P, Walsh Z, Crosby K, Callaway R, Belle-Isle L, Kay B, Capler R, Holtzman S. Substituting cannabis for prescription drugs, alcohol, and other substances among medical cannabis patients: The impact of contextual factors. *Drug Alcohol Rev* 2016;35:326–333]

**Key words:** cannabis, marijuana, substitution effect, substance use, addiction.

### Introduction

The medical use of cannabis can be traced back at least 5000 years [1,2], and by the late 19th century, cannabis-based preparations were widely marketed for medical use [3]. A variety of social and technological developments led to the stigmatisation and marginalisation of cannabis by the 1920s [4,5], and by

the 1940s, the international implementation of cannabis prohibition put an end to nearly all research into the use of cannabis for therapeutic purposes (CTP). The past decade has witnessed an increased interest in the therapeutic properties of cannabis, and a growing body of laboratory and clinical research attests to the many uses of cannabis-based medicines for diverse symptoms and conditions [6–9].

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Concurrent with increased recognition of the legitimate therapeutic use of cannabis is an international reappraisal of prohibitions for extra-medical cannabis use, with several nations exploring the potential costs and benefits of establishing legal access to cannabis outside of the medical system [10]. Legal access to cannabis might affect the broader social costs related to the use of both licit and illicit psychoactive substances, and a comprehensive analysis of the consequences of cannabis use must recognise potential effects on the use of other psychoactive substances such as prescription drugs, alcohol and illicit substances.

### *Substitution effect*

Substitution of psychoactive substances can be conceptualised within the context of behavioural economics, whereby commodities may have substitution, complementary or independent interrelationships with regard to rates of human consumption. In a seminal investigation of substitution and addictions, Hursh and colleagues [11] noted several factors that may affect substitution of one psychoactive substance for another, including changes in policy that affect availability, and changes to legal risk and associated repercussions. Population-level studies have identified substitution resulting from shifts in the legal risk associated with the use of a particular substance, such as decriminalisation [12].

In regards to psychoactive/pharmacological substitution, Hursh *et al.* [11] add that ‘pharmacological therapies for the treatment of drug abuse can also be conceptualised as alternative commodities that either substitute for illicit drug use (e.g. agonist therapy) or reduce the potency of illicit drugs directly (e.g. narcotic antagonist therapy)’ (p. 25). Prominent examples of the harm-reducing potential of substituting one psychoactive substance for another include the prescription use of methadone as a substitute to injection heroin use [13] and the use of nicotine patches to curb or stop tobacco smoking [14]. Additionally, the cannabis extract nabiximols [Sativex (<http://www.gwpharm.com/Sativex.aspx>)] has been investigated as a potential agonist for cannabis withdrawal in a treatment-seeking cohort, finding that while nabiximols attenuated cannabis, which is a 1:1 THC/CBD buccal spray, withdrawal symptoms, placebo was as effective in promoting long-term reductions in use [15].

The use of cannabis as a substitute for prescription drugs, alcohol and other substances has been identified in a number of studies. Deliberate cannabis substitution has been reported by heroin and pharmaceutical opiate users [16]. A number of smaller studies have also found that cannabis appears to reduce the cravings for other drugs of dependence like crack cocaine [17], alcohol

[18] and opiates [19–21], and may improve some treatment outcomes for substance dependence [22]. A complementary line of research has found that cessation of cannabis use is associated with increased use of other substances like alcohol and cigarettes [15,23].

The effectiveness of cannabis as a substitute for other substances has been proposed to reflect diverse neurochemical and cognitive processes [17]. From a patient perspective, recent surveys of CTP users in Canada and the USA identified less withdrawal, fewer side effects, and better symptom management as primary reasons for cannabis substitution [6,18,24].

### *Medical cannabis in Canada*

In Canada, several court cases have upheld the rights of patients to choose cannabis as medicine (e.g. *R. v. Smith, 2013*; *R. v. Beren and Swallow, 2009*; *Hitzig et al. v. Canada, 2003*; *R. v. Parker, 2000*; *Wakeford v. Canada, 2000*), and the 2001 *Marihuana Medical Access Regulations* established means for Canadians to obtain legal authorisation to possess CTP. Despite widespread concern with the efficiency of the Health Canada programme [25–28], registration has grown from fewer than 500 registrants in 2002 to over 26 000 in 2012 [29]. However, the *Marihuana Medical Access Regulations* have been noted for presenting substantial barriers to access [25–28], and fewer than 10% of the estimated one million Canadian individuals who use CTP are authorised through the federal programme [28,30,31]. The authorised versus unauthorised status of users of CTP represents a legal risk factor that might be expected to influence substitution.

Ability to afford CTP has also been identified as an important factor that affects access [25,31], and may therefore be expected to impact substitution. Additionally, several studies have identified analgesia as a prominent reason for using CTP, and cannabis has several potential advantages relative to widely used opiate analgesics including fewer side-effects, a lower risk of dependence, and no possibility of fatal overdose [20]. Therefore, those who use cannabis to address pain-related conditions might be expected to report relatively higher rates of substitution for prescription drugs for pain. History of problematic substance use might also influence rates of substitution, as individuals working to maintain abstinence from other substances may be more likely to use cannabis as a substitute [19].

In sum, prior research has identified cannabis as a potential substitute for other substances among CTP and community samples, however no studies have examined the extent to which cannabis substitution varies according to theoretically important factors such as authorisation to possess cannabis, affordability

of cannabis, substance use history, medical condition, and age. We expect that higher levels of access associated with authorised status and with greater affordability of CTP will be associated with increased likelihood of cannabis substitution for prescription drugs, alcohol, and illicit drugs, and that younger patients will be more likely to report substitution effect for alcohol and illicit substances due to the higher rates of use of these substances in those under 40 years old in the general population. Finally, we predict that individuals with histories of problematic substance use will report higher rates of substitution for alcohol and illicit substances.

## Methods

Participants were 473 self-identified current users of CTP drawn from the Cannabis Access for Medical Purposes Survey (CAMPS) [32], with complete data regarding use of cannabis as a substitute. CAMPS is the largest polling of Canadian medical cannabis patients to date, and involved the administration of multi-part questionnaire of 414 forced choice and open-ended items that queried demographic information, medical conditions and symptoms, and patterns of cannabis use. Participants were surveyed in 2011–2012 online or in person at a medical cannabis dispensary. The study and survey were developed with the assistance of a community research board, and recruitment was assisted by dispensaries, by organisations that serve people who use CTP (e.g. Canadian AIDS Society, Canadian Aboriginal AIDS Network), and by social media and traditional media reporting on the project. The study was reviewed and approved by the Behavioural Research Ethics Board of the University of British Columbia. Respondents were 68% men, 90% European-Canadian and 9% Aboriginal. Ages ranged from 17 to 78 years, with a median age of 40. Participants presented with the range of conditions that is generally consistent with surveys of CTP users, the most prominent conditions being pain (32%), mood (i.e. anxiety and depression; 18%), arthritis (15%), HIV (10%), gastrointestinal disorder (7%) (Table 1; see Walsh *et al.*, 2013 [32] for a detailed account of CAMPS methodology and participant characteristics).

*Substitution* was measured using three dichotomous items (yes/no), each of which referred to a distinct class of substance. Participants were asked if they had substituted cannabis for: (i) prescription drugs; (ii) alcohol; and (iii) illicit substances. Positive responses branched to a follow-up query asking participants to rank six reasons for substitution as follows: *less adverse side effects from cannabis, less withdrawal symptoms with cannabis, the ability to obtain cannabis versus other drugs, social acceptance of cannabis is greater than other drug, better symptom*

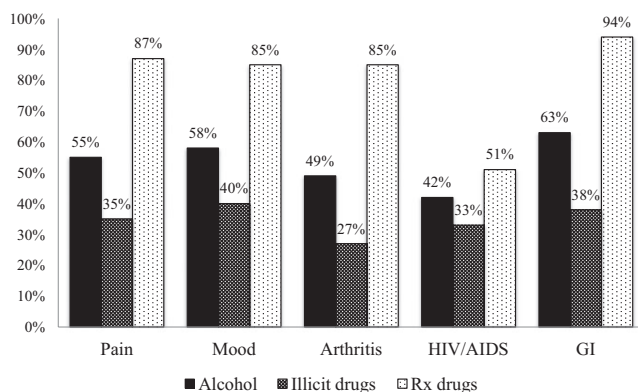
**Table 1.** Sample characteristics

|                   | CTP users, % (n) |
|-------------------|------------------|
| Gender            |                  |
| Male              | 68 (319)         |
| Ethnicity         |                  |
| European-Canadian | 90 (424)         |
| Aboriginal        | 9 (41)           |
| Medical condition |                  |
| Pain              | 32 (149)         |
| Mood              | 18 (81)          |
| Arthritis         | 15 (71)          |
| HIV/AIDS          | 10 (45)          |
| GI                | 7 (32)           |
| Age (years)       |                  |
| 18–24             | 15 (68)          |
| 25–34             | 25 (114)         |
| 35–44             | 20 (90)          |
| 45–54             | 26 (115)         |
| 55+               | 14 (63)          |
| Education         |                  |
| <HS               | 4 (18)           |
| HS grad           | 38 (180)         |
| Post secondary    | 58 (275)         |
| Income (\$)       |                  |
| <20 000           | 33 (160)         |
| 20 000–39 999     | 25 (118)         |
| 40 000–59 999     | 17 (78)          |
| 60 000+           | 24 (111)         |
| Residence         |                  |
| Rural             | 21 (97)          |
| Urban             | 79 (370)         |

CTP, cannabis for therapeutic purposes; GI, gastrointestinal disorder; HS, high school.

*management from cannabis than from alcohol or other drugs*, and an *other* category, which was followed by space for an open response. This approach and the selection of items for the substitution reasons are derived from prior studies of substitution [6,18].

Participants were asked to indicate the single primary *condition* treated with cannabis, as well as any number of primary symptoms cannabis use alleviated (Figure 1). We created a dichotomous *pain condition* variable by aggregating respondents who identified the primary condition treated with CTP as spinal pain, non-spinal pain, or arthritis ( $n = 220$ ), and comparing these participants to an aggregation of all other conditions ( $n = 241$ ). A large contingent of these non-pain respondents nonetheless endorsed *pain* among the symptoms for which they used CTP (71%,  $n = 171$ ), therefore, we conducted supplementary analyses comparing those who endorsed treating pain with CTP among a list of symptoms (83%,  $n = 390$ ) with those who did not endorse treating pain with CTP (17%,  $n = 82$ ). We also compared those who used cannabis primarily to treat the *depression* or *anxiety* ( $n = 81$ ) to an



**Figure 1.** Frequency of substitution across top five reported medical conditions.

aggregation of all other conditions ( $n = 379$ ). Approximately, one-third of respondents had obtained federal authorisation to possess cannabis (32%,  $n = 152$ ), and we used a dichotomous *authorisation* variable to compare authorised versus unauthorised patients. Participants were queried regarding ability to afford CTP, and were divided into those who could *always* or *often* afford CTP (46%,  $n = 214$ ) and those who could *sometimes* or *never* afford CTP (54%,  $n = 252$ ). We also compared respondents with a history of treatment for problematic alcohol or other substance use (15%,  $n = 71$ ) to those with no such history (85%,  $n = 402$ ). Finally, we examined self-reported reasons for substitution and associations between substitution and quantity of cannabis use. Logistic regression analyses were used to examine the associations between these variables and dichotomous indices of (presence/absence) the three types of substitution. All significance tests were two-tailed.

## Results

Substituting cannabis for one or more of alcohol, illicit drugs, or prescription drugs was reported by 87% ( $n = 410$ ) of respondents, with 36% ( $n = 168$ ) substituting cannabis for only one class of substances, 25% ( $n = 118$ ) substituting for two classes, and 26% ( $n = 124$ ) substituting for all three classes. Examination by class of drug (Table 2) identified substitution for prescription drugs as the most commonly reported form of substitution (80%), followed by alcohol (52%), and illicit substances (33%). The most commonly endorsed reasons for substitution were 'less adverse side effects' (51%,  $n = 208$ ), followed closely by 'better symptom management' (49%,  $n = 199$ ).

### Amount used

Median weekly amount of cannabis used was 14 g. Comparisons based on a median split of higher versus

lower quantity users indicated that quantity of use was not associated with differences in the observed levels of any of the three forms of substitution; for prescription drugs [odds ratio (OR) = 0.77, 95% confidence interval (CI) = 0.44–1.37], alcohol (OR = 1.44, 95% CI = 0.95–2.19) or illicit drugs (OR = 0.93, 95% CI = 0.60–1.45).

### Medical condition

Participants who identified pain-related conditions as the primary reason for using CTP were more likely to report substituting cannabis for prescription drugs (OR = 1.99, 95% CI = 1.23–3.21), but did not differ with regard to rates of substituting cannabis for alcohol (OR = 1.01, 95% CI = 0.76–1.59), or illicit substances (OR = 0.96, 95% CI = 0.65–1.42). Supplementary analyses comparing those who endorsed pain as a symptom treated with CTP to those who listed a non-pain-related primary condition treated with CTP produced a parallel pattern of results: those who used CTP to treat pain were more likely to substitute cannabis for prescription drugs (OR = 1.92, 95% CI = 1.12–3.30), and did not differ from respondents who did not endorse CTP use for pain with regard to substituting cannabis for alcohol (OR = 1.03, 95% CI = 0.64–1.66) or illicit substances (OR = 1.30, 95% CI = 0.77–2.20). Participants who used CTP primarily to treat depression or anxiety did not differ from other participants with regard to prescription drugs (OR = 1.49, 95% CI = 0.77–2.89), alcohol (OR = 1.35, 95% CI = 0.83–2.19), or illicit substances (OR = 1.43, 95% CI = 0.87–2.35).

### Authorisation

Comparison of authorised versus unauthorised status indicated that authorised users (Table 2) were marginally less likely to substitute cannabis for alcohol (OR = 0.63, 95% CI = 0.43–0.93), and did not differ with regard to substituting for prescription drugs (OR = 1.45, 95% CI = 0.87–2.41), or illicit substances (OR = 0.92, 95% CI = 0.61–1.39).

### Affordability

Respondents who reported substituting cannabis for prescription drugs were moderately more likely to report difficulty affording sufficient quantities CTP (OR = 0.59, 95% CI = 0.37–0.94). Affordability was not related to substitution for alcohol (OR = 0.75, 95% CI = 0.52–1.08) or for illicit substances (OR = 1.01, 95% CI = 0.68–1.49).

**Table 2.** Patients who report substituting cannabis for alcohol and other drugs by condition, authorisation, affordability, addiction treatment, and age

|                    | Medical condition |      | Authorisation |            | Affordability |     | Addiction treatment history |      | Age  |         |       |
|--------------------|-------------------|------|---------------|------------|---------------|-----|-----------------------------|------|------|---------|-------|
|                    | All               | Pain | Other         | Authorised | Unauthorised  | No  | Yes                         | No   | Yes  | Younger | Older |
| R <sub>x</sub> (%) | 80                | 86** | 75**          | 84         | 79            | 84* | 76*                         | 80   | 85   | 84**    | 76**  |
| Alcohol (%)        | 52                | 53   | 51            | 44*        | 55*           | 55  | 48                          | 52   | 51   | 62**    | 41**  |
| Illicit (%)        | 33                | 32   | 33            | 31         | 33            | 33  | 33                          | 29** | 54** | 37**    | 26**  |

Note: R<sub>x</sub> = prescription drugs; affordability: no = *sometimes* or *never* afford cannabis for therapeutic purposes (CTP), yes = *always* or *often* afford CTP; age: younger = <40 years old, older = ≥40 years old; groups differences \**P* < 0.05, \*\**P* < 0.01 (two-tailed).

### Addiction treatment history

Comparison according to any history of treatment for problematic substance use indicated that those who had a history of treatment exhibited higher levels of substituting cannabis for illicit substances (OR = 2.16, 95% CI = 1.52–3.06), but did not differ from those without a treatment history with regard to substituting cannabis for alcohol (OR = 1.01, 95% CI = 0.73–1.40) or for prescription drugs (OR = 1.37, 95% CI = 0.84–2.21).

### Age

Respondents who substituted cannabis for prescription drugs were younger [M = 38.58 standard deviation (SD) = 12.57] than those who did not engage in this class of substitution [M = 44.26 (SD = 13.90)], (OR = 0.97, 95% CI = 0.95–0.99). Similarly, respondents who substituted cannabis for alcohol were younger [M = 36.65 (SD = 12.99)] than those who did not engage in this class of substitution [M = 42.84 (SD = 12.26)], (OR = 0.96, 95% CI = 0.95–0.98), and respondents who substituted cannabis for illicit substances [M = 36.50 (SD = 12.55)] were younger than those who did not engage in this class of substitution [M = 41.13 (SD = 13.01)] [M = 42.84 (SD = 12.26)], (OR = 0.97, 95% CI = 0.96–0.99).

## Discussion

The results of this study are consistent with a growing body of research suggesting that cannabis use may play an important role in the use of prescription drugs, alcohol and illicit substances. Although we identified generally high rates of substitution across all patients, we also identified variability in rates of substitution across substances and contextual factors. Specifically, using cannabis for pain relief was associated with substituting cannabis for prescription medications; having a history of treatment for substance use was associated

with substituting for illicit substances; and younger age was associated with higher rates of substitution across all substances. We also found that respondents who used CTP without authorisation were more likely to use cannabis as a substitute for alcohol, whereas those substituting cannabis for prescription drugs were more likely to have difficulty affording cannabis.

The high rate of substitution for prescribed substances, particularly among patients with pain-related conditions, suggests that further research into cannabis/cannabinoids as a potentially safer substitute for or adjunct to opiates is justified, and adds to research suggesting this phenomenon is robust across samples [6,20]. This includes a study by Bachhuber *et al.* that examined the association between the medical cannabis laws in US states and opiate overdose deaths, which found nearly 25% lower mean annual rates of opioid overdose mortality among states that allowed medical cannabis, noting that the protective influence of medical cannabis regulation grew stronger over time [33]. The recent rise of addiction to pharmaceutical opiates in Canada and around the world and an associated increase in opiate-related morbidity and mortality [34–36] highlights the importance of exploring this context for substitution and its potential public health impacts.

The finding that cannabis was substituted for alcohol and illicit substances suggests that the medical use of cannabis may play a harm reduction role in the context of use of these substances, and could have implications for substance use treatment approaches requiring abstinence from cannabis in the process of reducing the use of other substances. Furthermore, public policies informed by evidence that cannabis might be a substitute for alcohol [12,18,23,37] could have an impact on overall rates of alcoholism, as well as alcohol-related automobile accidents, violence, and property crime [38].

The novel finding that patients under 40 reported a higher rate of substitution than older patients poten-

tially reflects more established patterns of substance use among older patients. In addition, younger patients typically use more psychoactive substances in the first place, leading to greater opportunities for substitution [30]. This finding suggests that older patients might benefit from education regarding the potential of cannabis to serve as a substitute for prescription drugs, alcohol, and illicit substances and indicates that future research on cannabis substitution should consider the age of the sample.

The finding that higher rates of substituting cannabis for prescription drugs was associated with lower ability to afford cannabis warrants consideration, and may reflect increased demand—and therefore higher cost—for cannabis related to use for this purpose. Such an interpretation is consistent with our finding that affordability was inversely associated with substitution of prescription medications, as such medications are subsidised in Canada, making them generally less expensive than cannabis. In contrast, alcohol and illicit drugs may be more expensive than cannabis, and therefore substitution of cannabis for these substances would not be expected to be associated with financial stress. Indeed, as we did not find that cannabis substitution for prescription medications was associated with the use of a greater quantity of cannabis, findings related to economic pressure suggests that affordability might limit cannabis use, adding to research that highlights the importance of affordability for maximising efficient access to cannabis [25,31].

The finding of higher levels of substituting cannabis for alcohol among unauthorised users was surprising, as prior research identified few differences between authorised and unauthorised Canadians who use CTP [32]. We propose that the actual government-regulated authorisation process may have led to a formalisation of medical cannabis use among authorised patients, limiting their reported reasons for the use of medical cannabis to those recognised and approved by their physician and Health Canada. However, further research that directly queries this issue is required to confirm this hypothesis.

### *Limitations*

The limitations of this study are common to online medical surveys, such as the potential for multiple responses from a single respondent, a potentially unrepresentative sample, and lack of physician confirmation of medical conditions. Since no data was gathered on the extent of self-reported substitution, it is not possible to determine how much actual prescription drug, alcohol or illicit drug use was substituted for, and variable time frame for retrospective reporting may impact the reliability of recall. Furthermore, response

bias related to participant self-selection and recruitment through organisations that support medical cannabis patients likely resulted in overrepresentation of individuals who respond favourably to the medical use of cannabis. Additionally, all data regarding the cannabis substitution effect in this study were self-reported by patients and did not benefit from biological drug detection to confirm use or non-use of a substance. In light of this potential bias, our characterisation of the therapeutic use of cannabis and/or cannabis substitution effect should be interpreted with caution pending replication by research that employs a more systematic recruitment approach and biological drug testing. However, these limitations are counterbalanced by several methodological strengths, including the size of the sample, the inclusion of an in-person subsample, and adherence to established standards for reporting Internet-based surveys [39].

### **Conclusions**

Taken together, our findings provide additional evidence for the widespread nature of cannabis substitution and suggest potentially fruitful avenues for further research that elucidates the complex interaction between cannabis use and the use of other substances. In particular, as the therapeutic and recreational uses of cannabis continue to be normalised, research that explicitly investigates contexts and motives for substitution, particularly in younger adults, might help to maximise the health benefits of this emerging phenomenon. Further research is needed to better estimate the extent of substitution, and to specify differences in substitution across prescription drugs (i.e. opiates, benzodiazepines, anti-inflammatories), and other substances such as tobacco and caffeine. To this end, we recommend the development of a psychometrically valid instrument to facilitate the reliable assessment of cannabis substitution across diverse samples, contexts and substances.

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### **Conflict of interests**

Philippe Lucas is currently employed as Vice-President, Patient Research and Services for Tilray, a federally

authorised medical cannabis company. However, he was not employed by Tilray during the preliminary planning, data collection and analysis of this study, and his compensation is not tied in any way to the outcomes of this study. None of the other authors have any conflicts of interest with regard to the contents of this paper.

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