

# Cannabis as a substitute for alcohol and other drugs: A dispensary-based survey of substitution effect in Canadian medical cannabis patients

Philippe Lucas<sup>1</sup>, Amanda Reiman<sup>2</sup>, Mitch Earleywine<sup>3</sup>, Stephanie K. McGowan<sup>4</sup>, Megan Oleson<sup>5</sup>, Michael P. Coward<sup>6\*</sup>, & Brian Thomas<sup>7</sup>

<sup>1</sup>Centre for Addictions Research of BC, PO Box 1700 STN CSC, Victoria, BC V8W 2Y2, Canada, <sup>2</sup>School of Social Welfare, University of California, 120 Haviland Hall, Berkeley 94720, CA, USA, <sup>3</sup>Department of Psychology, University at Albany, State University of New York, 1400 Washington Ave, Albany 12222, NY, USA, <sup>4</sup>Vancouver Island Compassion Society, 853 Cormorant St., Victoria, BC V8W 1R2, Canada, <sup>5</sup>British Columbia Compassion Club Society, 2995 Commercial Drive, Vancouver, BC V5N 4C8, Canada, <sup>6</sup>The Vancouver Dispensary Society, 880 East Hastings, Vancouver, BC V6A 1R6, Canada, and <sup>7</sup>Green Cross Society of BC, 2127 Kingsway, Vancouver, BC V5N 2T4, Canada

(Received 2 May 2012; accepted 20 September 2012)

**Background:** This article examines the subjective impact of medical cannabis on the use of both licit and illicit substances via self-report from 404 medical cannabis patients recruited from four dispensaries in British Columbia, Canada. The aim of this study is to examine a phenomenon called substitution effect, in which the use of one product or substance is influenced by the use or availability of another.

**Methods:** Researchers teamed with staff representatives from four medical cannabis dispensaries located in British Columbia, Canada to gather demographic data of patient-participants as well as information on past and present cannabis, alcohol and substance use. A 44-question survey was used to anonymously gather data on the self-reported impact of medical cannabis on the use of other substances.

**Results:** Over 41% state that they use cannabis as a substitute for alcohol ( $n = 158$ ), 36.1% use cannabis as a substitute for illicit substances ( $n = 137$ ), and 67.8% use cannabis as a substitute for prescription drugs ( $n = 259$ ). The three main reasons cited for cannabis-related substitution are “less withdrawal” (67.7%), “fewer side-effects” (60.4%), and “better symptom management” suggesting that many patients may have already identified cannabis as an

effective and potentially safer adjunct or alternative to their prescription drug regimen.

**Discussion:** With 75.5% ( $n = 305$ ) of respondents citing that they substitute cannabis for at least one other substance, and in consideration of the growing number of studies with similar findings and the credible biological mechanisms behind these results, randomized clinical trials on cannabis substitution for problematic substance use appear justified.

**Keywords:** Cannabis, marijuana, dispensary, substitution effect, addiction

## INTRODUCTION

### Background

Cannabis is the most popular illicit substance in the world (UNDCP, 2001); however, despite the high rate of recreational use and over 5000 years of therapeutic applications, this plant has resulted in relatively few serious negative physical or social impacts beyond the consequences associated with legal prohibitions on its use. (Grinspoon & Bakalar, 1993). However, the therapeutic use of cannabis remains highly controversial, and only a few Western nations have introduced policies or programs to allow legal access to medical cannabis.

Correspondence: Philippe Lucas, Centre for Addictions Research of BC, PO Box 1700 STN CSC, Victoria, BC V8W 2Y2, Canada. Tel: 250-370-0981. E-mail: plucasyyj@gmail.com

\*All contact for The Vancouver Dispensary Society should be directed to Dori Dempster, Executive Director.

Although Canada currently allows for limited access to medical cannabis through the federally-regulated Marihuana Medical Access Division (MMAD), this court-ordered program has been the source of much criticism by end-users and advocates, and has been found by courts to be unconstitutional in a number of decisions for unnecessarily limiting access to legal protection and a safe supply of cannabis. In response to both community needs and ineffective or non-existent federal medical cannabis policies, community-based medical cannabis dispensaries have emerged as primary suppliers of medical cannabis in both Canada and in a number of the US states that have legalized the medical use of cannabis.

Community-based medical cannabis dispensaries, often called *compassion clubs*, supply cannabis for therapeutic use upon a valid recommendation or confirmation of diagnosis from a licensed healthcare practitioner, and reflect a patient-centered strategy to alleviate the suffering of critically and chronically ill Canadians who might benefit from the medical use of cannabis (Belle-Isle, 2006; Lucas, 2008, 2009; Reiman, 2006, 2009).

During the late 1980s, as rates of HIV and AIDS began to rise in San Francisco, a few underground dispensaries began offering a safe source of cannabis to those needing it for medical purposes were established by compassionate people living with HIV/AIDS and drug policy reform activists. With the successful passage in 1996 of a state ballot initiative called "Proposition 215," California became the first US state to allow for the legal medical use and distribution of cannabis. Within a few weeks dozens of these "compassion clubs" opened, and although they often had varied policies and practices, their common goal was facilitating access to a safe supply of cannabis for medical users (Grinspoon, 1999). Since then, over 1000 community-based medical cannabis dispensaries have opened up in California (Los Angeles Times, 2009), and it is estimated that they currently supply over 250,000 state authorized patients (Gieringer, 2006). Similar organizations have emerged all over the world, and in Canada and the US these dispensaries remain the main source of cannabis-based medicines for therapeutic use.

There are a dozen or so well-established compassion clubs or societies in Canada (and according to the Canadian Association of Medical Cannabis Dispensaries, perhaps 54 in total),<sup>1</sup> the oldest and largest of which is Vancouver's British Columbia Compassion Club Society (BCCCS). The BCCCS opened in 1997 and now serves over 7000 members. Taking a holistic approach to health, this non-profit organization operates a Wellness Centre offering alternative treatments such as massage, acupuncture, counseling, and herbal and aromatherapy at a reduced cost to members of the society. The Vancouver Island Compassion Society (VICS), a registered non-profit society in B.C. since October 1999, uses its knowledge

and experience of cannabis and its therapeutic properties to implement an extensive research agenda, and over the last 10 years has been involved in more peer-reviewed medicinal cannabis research than any other organization in Canada (Lucas, 2008).

Communities, law enforcement, and criminal courts across Canada have shown support and tolerance for compassion clubs that self-regulate to ensure their services are strictly for medical purposes (Belle-Isle, 2006; Lucas, 2002, 2008, 2009, 2012). However, Canadian dispensaries continue to operate without legal sanction or protection, and to date very little research has been conducted on this rapidly expanding patient community to determine the impact of medical cannabis on the use of other substances or the quality of life of individual end-users.

### Substitution effect and addiction

*Substitution effect* is an economic theory that suggests that variations in the availability of one product (through changes in cost or social policy, for example), may affect the use of another:

Within a behavioral economic framework, reinforcer interactions are classified into multiple categories; two commodities may be "substitutes" for one another (e.g., two forms of opioid drugs); they may be "complementary," whereby the value of one is enhanced by consumption of the other; or they may be "independent," such that the reinforcing functions of one are not altered by the presence or absence of the other (Hursh, Galuska, Winger, & Woods, 2005, p. 24).

Changes in the use of cannabis (whether for medical or recreational use) in regards to the use of other substances can be the result of (a) economic shifts affecting end-user costs; (b) shifts in policy which effect availability; (c) legal shifts that affect criminal risk and associated repercussions; or (d) psychoactive/pharmacological substitution. In regards to psychoactive substitution, Hursh et al. (2005) suggest that "pharmacological therapies for the treatment of drug abuse can also be conceptualized 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).

Perhaps the best example of deliberate psychoactive substitution is the common prescription use of methadone as a substitute to injection heroin use. However, as suggested above, not all psychoactive substitution is the result of a deliberate decision made on an individual basis. At the population level, it is often the unintended result of public policy shifts or other social changes, such as cost or availability.

In an examination of hospital drug episodes in 13 US states that decriminalized the personal recreational use of cannabis in the 1970s, Model (1993) found that users shifted from using harder drugs to marijuana after its legal risks were decreased. Findings from Australia's 2001 *National Drug Strategy Household Survey* (Aharonovich et al., 2002)

specifically identify substitution effect, indicating 56.6% of heroin users substituted cannabis when their substance of choice was unavailable. The survey also found that 31.8% of people who use pharmaceutical analgesics for non-medical purposes reported using cannabis when pain-killers were not available. This evidence strongly suggests that the increased availability of cannabis (through a reduction of penalties or actual regulated, legal access) might lead to a reduction in the use of opiates and pharmaceutical analgesics and the associated personal, social and public health harms and costs.

Substitution among a medical *Cannabis* patient sample was recently documented in a few studies by Reiman (2006, 2009). In a sample of 130 medical *Cannabis* patients from California, 24 had reported previous alcohol treatment. Concerning the use of *Cannabis* as a substitute for alcohol, illicit or prescription drugs, Reiman (2006) observed that 50% of the sample reported using *Cannabis* as a substitute for alcohol, 47% for illicit drugs, and 74% using it as a substitute for prescription drugs. The two most common reasons reported for using *Cannabis* as a substitute were fewer side effects and better overall symptom management.

These results were replicated in a 2009 study of 350 medical *Cannabis* patients in California. 53% percent reported being current alcohol consumers and 11% reported using a drug other than *Cannabis* in the past 30 days. Forty percent reported having used *Cannabis* as a substitute for alcohol, 26% as a substitute for illicit drugs, and 66% as a substitute for prescription drugs. The most common reasons for substitution were again cited as less adverse side effects and better symptom management with *Cannabis* (Reiman, 2009).

Additionally, an analysis of 1655 potential medical *Cannabis* patients seeking recommendations from a clinic in California revealed that 13.2% reported using *Cannabis* as a substitute for alcohol and 50.8% reported using *Cannabis* as a substitute for prescription drugs (Nunberg, Kilmer, Pacula, & Burgdorf, 2011).

## CANNABIS AND PROBLEMATIC SUBSTANCE USE

While the illegal status of *Cannabis* across most of the world has made clinical trials on *Cannabis* as a treatment for problematic substance use nearly impossible, a number of studies on both humans and animals suggest that the cannabinoid system plays a role in dependence and addiction to both licit and illicit substances. For example, research shows that behavioural effects and motivational responses induced by nicotine can be modulated by the endocannabinoid system (Balerio, Aso, & Maldonado, 2006; Damaj and Lichtman, 2011; Muldoon, Lichtman, & Damaj, 2011). Furthermore, research by Blume et al. (2011) and Ramesh et al. (2011) suggests that cannabinoid receptors might interrupt signaling in the opioid receptor

systems, affecting both cravings for opiates and withdrawal severity.

Additionally, a study by the New York State Psychiatric Institute on people with cocaine dependence with comorbid Attention-Deficit Hyperactivity Disorder found that *Cannabis* users were more successful than other patients in abstaining from cocaine use (Levin, 2006). An earlier study by Labigalini Jr, Rodrigues, and Da Silveira (1999) also noted this effect on people with a dependence on crack cocaine, reporting that 68% of the 25 subjects who self-medicated with *Cannabis* in order to reduce cravings were able to give up crack altogether. Researchers theorize that this phenomenon is both biological and psychological. Addiction to stimulants result in a decline in the cerebral activity involving serotonin transmitters, which is believed to result in increased impulsiveness and craving. Cannabinoids act as serotoninergic agonists, and as serotonin levels increase, impulsiveness and craving decline. Reports from study subjects also suggest that the ritual of preparing *Cannabis* to smoke helped reduce the habituated psychological dependence associated with the preparation of crack cocaine.

Furthermore, recent research by Maitra, Bortoff, Pan, Reggio, and Seltzman (2011) suggests that cannabinoids might protect the liver from the effects of heavy alcohol use, and research by Liput, Pendergast, and Nixon (2011) and Devkota and Mukhopadhyay (2011) suggests a neuroprotective function of cannabinoids during alcohol withdrawal, and as a result of heavy alcohol use. Additionally methods for administering THC, such as trans dermally, for the treatment of alcoholism has been explored by Howard, Banks, Golinski, and Stinchcomb (2011).

Finally, exploratory research suggests that *Cannabis* use does not interfere with formal substance abuse treatment. Data from the California Outcomes Measurement System (CalOMS) were compared for medical (authorized) marijuana users ( $n = 18$ ) and non-marijuana users who were admitted to a public substance abuse treatment program in California. Behavioral and social treatment outcomes recorded by clinical staff at discharge and reported to the California Department of Alcohol and Drug Programs were assessed for both groups, and although the sample was small, *Cannabis* use did not seem to compromise substance abuse treatment amongst the medical marijuana using group, who (based on these preliminary data) fared equal to or better than non-medical marijuana users in several important outcome categories (e.g., treatment completion, criminal justice involvement, medical concerns) (Schwartz, 2010).

## METHODOLOGY

For this community-based study researchers teamed with a staff representative from four medical cannabis

dispensaries in British Columbia, Canada – three in Vancouver and one in Victoria – in order to gather demographic data as well as information on past and present medical cannabis, alcohol and substance use of 400+ patient-participants. Our goal was to assess the self-reported impact of medical cannabis on the use of other substances, including but not limited to reductions in patterns of problematic substance use, in order to examine a phenomenon called *substitution effect*.

The specific hypotheses investigated in this study include:

- (1) Whether or not the use of medical cannabis affects the use of other substances according to the self-assessment of patient-participants.
- (2) Whether or not these changes in substance use patterns result in net reductions or increases in the use of licit or illicit drugs.
- (3) Whether or not these changes can be attributed to “substitution effect.”

The four participating dispensaries are the BCCCS, the VICS, The Green Cross Society of British Columbia (GCSBC), and the Vancouver Dispensary Society (VDS).

The BCCCS first opened its doors in 1997, and now serves over 7300 patient-members. The GCSBC was founded in 2005, and serves 1182 patients. The VDS was founded in 2008, and currently serves over 3700 patients. While these three dispensaries are located in Metro Vancouver BC (pop. approx. two million), the VICS – which was founded in 1999 and serves 1400 patients – is located in the greater Victoria area (pop. approx. 250,000).

The study was sponsored by the participating dispensaries, and ethics approval was sought and received from Institutional Review Board Services (IRBS). Primary Investigator Philippe Lucas MA trained a staff member/co-investigator in each facility on how to dispense, gather, and track the anonymous survey instrument, which was filled out and collected on-site. The survey was largely based on a similar instrument created by co-researcher Amanda Reiman PhD for a study that took place at the Berkeley-based Berkeley Patient Group (Reiman, 2009), but was modified by Lucas to make it applicable to any dispensary patient population.

Each dispensary had a goal of gathering a minimum of 100 surveys, and in order to ensure the randomness of the survey population, the co-investigators also tracked how many dispensary clients decline to participate in the study. Ultimately, a total 32 potential patient-participants chose not to take this survey when approached by dispensary staff. Data entry of completed surveys was then done by Mitch Earleywine PhD (State University of New York), and data were analyzed in SPSS by Reiman, who also calculated frequencies.

## RESULTS

### Demographics

The total survey sample for this study was 404 medical cannabis patients between the ages of 17–71 registered with at least one of the four participating B.C.-based dispensaries. The sample was 67.1% male ( $n=259$ ), 71.6% Caucasian ( $n=275$ ) and 12.5% First Nations ( $n=48$ ), with a mean age of 44.12. Ethnicity differs significantly based on dispensary location ( $p<0.05$ ). Caucasians are over-represented at VDS and VICS and under-represented at Green Cross. First Nations patients are over-represented at Green Cross and African Americans are over-represented at VDS.

In regards to marital status, 55.3% report that they are single ( $n=213$ ), 15.3% are married, 13.2% are divorced and 12.7% have a domestic partner. Eighteen percent state that they have a full-time job ( $n=71$ ), while 14.3% have part-time employment, and 14.1% are unemployed. Nearly 46% report that they are disabled ( $n=179$ ) and therefore unable to work, and 85.5% ( $n=329$ ) state that they suffer from a chronic condition. Employment is significantly different between dispensary location ( $p<0.05$ ). Full time workers are over-represented at VDS and under-represented at VICS and BCCCS. Unemployed patients are over-represented at Green Cross. Disabled patients are over-represented at VICS, Green Cross and BCCCS and under-represented at VDS.

In terms of education, 17.3% had less than a high school education ( $n=67$ ), 24% had a high school or equivalent education, and 30.9% report having attended some college courses ( $n=120$ ). Just over 24% had a college degree, and 7.2% had a graduate degree. Education differs significantly by dispensary location ( $p<0.01$ ). Those without a high school diploma and high school graduates are over-represented at Green Cross. Patients with some college are over-represented at VICS and BCCCS and under-represented at Green Cross. Patients with a college or graduate degree are over-represented at VDS and VICS and under-represented at Green Cross and BCCCS.

Income levels appeared to be significantly lower than the Canadian average of \$28,840cdn from 2009 with 58.2% reporting that they had incomes of less than \$20,000 per annum ( $n=219$ ). Twenty-four percent report earning between \$20,000 and \$39,999, and 17.4% earn \$40,000 or more. This compares with 63.4% of the Canadian population that report earning \$20,000 and over (Statistics Canada, 2012). Income differs significantly between dispensary locations ( $p > 0.01$ ). Low income patients (less than \$20,000) are over-represented at VICS, Green Cross and BCCCS and under-represented at VDS. High income patients (greater than \$80,000) are over-represented at VDS and VICS, and under-represented at Green Cross.

### Dispensary access and cannabis usage

In terms of patient access and use of dispensaries, 38.8% report attending a dispensary a couple of days per week ( $n=150$ ), with 15.5% going daily. 20.4% attend once per week, 19.1% one or two times per month, and 5.4% use these services less than once per month. Additionally, 29.1% state that they access more than one dispensary. When asked to rank what factors are most important to them in choosing and using the dispensary where they filled out the survey, the staff topped the list (8.85 on a scale of 1–10, with 1 being of “non-important” and 10 being “extremely important”), followed by the quality of the cannabis products (8.8), comfort and security (8.59), convenient hours (8.23), the variety of medicines (7.85), familiarity with the facility (7.81), and variety of services offered (7.40). Lowest on the list were closeness to home (5.82) and knowing the other patients (4.72).

When asked how about their primary method of ingestion, 48.8% reported using joints or blunts ( $n=197$ ), 10.4% used a pipe, 6.2% used a water pipe/bong, and 7.9% use oral ingestion (baked goods, oils, and tinctures). Only 4.7% report using a vaporizer as their primary method of ingestion. This is more than twice the rate of vaporizer use Earleywine and Smucker Barnwell (2007) found in a general survey of cannabis users, which suggests that this sample has a high commitment to potentially healthier ingestion techniques compared to cannabis users in the general population. Eighty eight percent report daily use, with 30.2% reporting that they use cannabis more than four times per day ( $n=122$ ). 52.6% report using between six and eight grams per week ( $n=201$ ), with 23.3% using less than that, and 24.1% using 10 grams or more per week.

### Substance use and substitution

Forty percent of respondents report current alcohol use, and 49% smoke tobacco. Nearly 20% cite that they have used a drug other than cannabis or prescription drugs in the past 30 days, with the most common drugs reported being crack/cocaine ( $n=21$ ); heroin ( $n=10$ ); methamphetamine ( $n=7$ ); and MDMA ( $n=6$ ). Over 52% report that they were raised in an alcoholic or abusive family environment ( $n=195$ ), and 19.6% state that they have been treated for alcohol dependence ( $n=74$ ), with over 5% ( $n=22$ ) participating in a 12 step program, and 3.5% ( $n=14$ ) in type of another alcohol recovery program. Additionally, 26.8% reporting a history of substance abuse ( $n=101$ ).

In regards to substitution, a total of 75.5% ( $n=305$ ) of respondents stated that they substitute cannabis for another substance. Over 41% cite that they use cannabis as a substitute for alcohol ( $n=158$ ), 36.1% use cannabis as a substitute for illicit substances ( $n=137$ ), and 67.8% use cannabis as a substitute for prescription drugs ( $n=259$ ). Reasons cited included fewer side-effects from cannabis use as compared to

alcohol, illicit or prescriptions drugs (39.6%), less withdrawal from cannabis (67.7%), and better symptom management from cannabis (53.9%).

While those who use cannabis as a substitute for alcohol are significantly more likely to be male ( $p<0.05$ ) and to make between \$40 and \$59,000 annually ( $p<0.05$ ), we found no difference in age. Additionally, they were significantly more likely to be current drinkers and to report a history of alcohol and substance abuse ( $p<0.05$ ). There was no relationship between alcohol substitution and current cigarette or illicit drug use.

Those who report using cannabis as a substitute for illicit drugs are significantly more likely to be men, to have a domestic partner, and to be First Nations. They are significantly less likely to be married, and are significantly younger than those who do not report substitution for illicit drugs ( $p<0.05$ ). Using cannabis as a substitute for illicit drugs was also significantly associated with current cigarette and illicit drug use, and previous alcohol and substance abuse ( $p<0.01$ ). It was not associated with current alcohol use.

When considering the use of cannabis as a substitute for prescription drugs, the only demographic factor significantly related was insurance status. Those without additional health insurance were significantly more likely to substitute cannabis for prescription drugs ( $p<0.01$ ). Using cannabis as a substitute for prescription drugs was not associated with current alcohol, cigarette or illicit drug use, or with previous alcohol or substance abuse.

Amount of cannabis used per week, frequency of use and reported change in cannabis use over the past six months were not related to alcohol or illicit drug substitution. This was also the case for prescription drugs, except for change in cannabis use; those who report substitution are significantly more likely to report an increase in their cannabis use over the past six months ( $p<0.05$ ).

There were no significant associations between dispensary or size of the community the dispensary is located in for alcohol and prescription drugs substitution and no difference in size of the community and illicit drug substitution. However, specific dispensaries were significantly associated with illicit drug substitution ( $p<0.05$ ), with patients from VDS and the Green Cross being more likely to report substitution, and patients from BCCCS less likely.

## DISCUSSION

Self-report surveys from over 400 medical cannabis users from multiple Canadian dispensaries revealed that over 75% of respondents turn to cannabis as an alternative to some other substance.

In comparing these results with Reiman’s 2009 study of cannabis as a substitute for alcohol and other drugs in patients accessing cannabis at the Berkeley

Patient Group, on average almost twice as many Canadian patients reported using a drug other than cannabis or pharmaceuticals in the past 30 days (11% vs. 19.7%). As a result, it is not surprising that more Canadian patients subsequently report using cannabis as a substitute for illicit substances (36.1%) than the American cohort (26%). Otherwise, the rates of overall use as well as of self-reported substitution for alcohol and pharmaceutical drugs are very similar in both studies.

With the recent rise in pharmaceutical opiate addiction (Dhalla, Mamdani, & Sivilotti, 2009; Fischer, Rehm, Goldman, & Popova, 2008; SAMHSA, 2007), and an associated increase in opiate-related morbidity and mortality (Moore, Cohen, & Furberg, 2007), cannabis may prove to be a safer substitute to address chronic pain issues. The three main reasons cited for cannabis-related substitution in this survey are “less withdrawal” (67.7%), “fewer side-effects” (60.4%), and “better symptom management” suggesting that many patients may have already identified cannabis as an effective and potentially safer adjunct or alternative to their prescription drug regimen.

Additionally, since the intravenous use of pharmaceutical and illicit opiates, crack and cocaine, and crystal meth can all lead to the transmission of serious conditions like HIV/AIDS and hep-c, evidence suggesting that cannabis might be an effective substitute for these highly addictive substances could be part of a public health-centered harm reduction strategy aimed at reducing disease transmission and overdoses stemming from injection drug use. This might be accomplished on a case-by-case basis by having physicians prescribe cannabis for addiction to individual patients where legally possible, or at the population level by reducing the penalties associated with cannabis use. Such policy shifts could have a tremendous potential to save or redirect scarce public resources away from the arrest of otherwise law-abiding adults and to reduce the high rate of morbidity and mortality associated with the use of injection drugs.

Furthermore, since alcohol has a far greater social, health and financial impact on individuals and communities than all illicit substances combined, public policies informed by evidence that cannabis might be a substitute or actual treatment for alcohol addiction (Mikuriya, 2004; Reiman, 2006, 2009) could have a significant impact on overall rates of alcoholism, as well as alcohol-related automobile accidents, violence, and property crime.

While some studies have found that a small percentage of the general population that uses cannabis may develop a dependence on this substance (Lopez-Quintero, 2011; Perkonigg, 2008), a growing body of research on cannabis-related substitution suggests that for many patients cannabis is not only an effective medicine, but also a potential *exit drug* to problematic substance use. Given the credible biological, social and

psychological mechanisms behind these results, and the associated potential to decrease personal suffering and the personal and social costs associated with addiction, further research appears to be justified on both economic and ethical grounds. Clinical trials with those who have had poor outcomes with conventional psychological or pharmacological addiction therapies could be a good starting point to further our understanding of cannabis-based substitution effect.

## LIMITATIONS

Given that this is a preliminary survey study, the results of this research cannot be readily translated to population-level generalizations. Patients who are extremely ill might not be able to take the time to fill out the survey. Additionally, medical cannabis patients might differ substantially from the greater population of cannabis users, and those patients who access dispensaries may differ from patients who produce cannabis for themselves or who obtain it through other means. Furthermore, although the survey was anonymous, the legal status of cannabis and other illicit substances might have affected the accuracy of patient responses. Finally, it is impossible to substantiate self-reported instances of substitution, so results reflect the patient’s own understanding substitution *vis-a-vis* their substance use history. However, since these results support other studies that suggest medical cannabis may reduce the use and potential abuse of other drugs, further investigations should be conducted to examine the potential for cannabis to play a role in the treatment of addiction, both in the patient and general population.

**Declaration of interest:** Funding for this study was provided by the participating dispensaries to cover the cost of independent peer-review and a research contract with Philippe Lucas MA, the Primary Investigator of the study. Additionally, Mr Lucas is the former Executive Director of the Vancouver Island Compassion Society (VICS), one of the four study sites in this project, and currently has a volunteer position on the VICS Board of Directors. Co-investigators Steffani McGowan, Megan Oleson, Michael Coward, Dori Dempster, and Brian Thomas were all employed by participating dispensaries during the course of this research.

## NOTE

1. Correspondence with Jeet-Kei Lung, member of the CAMCD Board of Directors, April 2012.

## REFERENCES

- Aharonovich, E., Garawi, F., Bisaga, A., Brooks, D., Raby, W.N., Rubin, E., ... Australian Institute of Health and Welfare (2002) 2001 National Drug Strategy Household Survey: First results. *AIHW cat. no. PHE 35*. Canberra: AIHW (Drug Statistics Series No. 9). Retrieved from <http://www.aihw.gov.au/publication-detail/?id=6442467340>
- Balerio, G., Aso, N.E., & Maldonado, R. (2006). Role of the cannabinoid system in the effects induced by nicotine on anxiety-like behaviour in mice. *Psychopharmacology*, *184*, 504–513.
- Belle-Isle, L. (2006). *Cannabis as therapy for people living with HIV/AIDS; Our Right, Our Choice*. Canadian AIDS Society. Retrieved from [http://www.cdnaids.ca/files.nsf/pages/cannabis\\_english/\\$file/cannabis\\_english.pdf](http://www.cdnaids.ca/files.nsf/pages/cannabis_english/$file/cannabis_english.pdf)
- Blume, L., Bass, C., Childers, S., Dalton, G., Richardson, J., Selley, D., ... Howlett, A. (2011). Cannabinoid receptor interacting protein 1A (CRIP1A) modulates striatal neuropharmacology and signal transduction in cannabinoid, dopamine and opioid receptor systems (2011). *21st Annual Symposium on the Cannabinoids* (pp. 2–21). Research Triangle Park, NC: International Cannabinoid Research Society.
- Damaj, M., & Lichtman, A. (2011) Nicotine reward: A role for CB2 receptors? *21st Annual Symposium on the Cannabinoids* (p. 45). Research Triangle Park, NC: International Cannabinoid Research Society.
- Devkota, S., & Mukhopadhyay, S. (2011) Cannabinoid-ethanol interaction in the regulation of developing neurogenesis in zebrafish brain. *21st Annual Symposium on the Cannabinoids* (pp. 3–8). Research Triangle Park, NC: International Cannabinoid Research Society.
- Dhalla, I., Mamdani, M., & Sivilotti, M. (2009). Prescribing of opioid analgesics and related mortality before and after the introduction of long-acting oxycodone. *CMAJ*, *181*, 891–896.
- Earleywine, M., & Smucker Barnwell, S. (2007). Decreased respiratory symptoms in cannabis users who vaporize. *Harm Reduction Journal*, *4*, 11.
- Fischer, B., Rehm, J., Goldman, B., & Popova, S. (2008). Non-medical use of prescription opioids and public health in Canada: An urgent call for research and intervention development. *Canadian Journal on Public Health*, *99*, 182–184.
- Gieringer, D. (2006). *10th Anniversary of Prop. 215; California Leads, Feds Still Lag on Medical Marijuana*. Oakland, CA. Retrieved from California NORML website: <http://canorml.org/news/10thAnniversaryProp215.htm>
- Grinspoon, L. (1999). Medical marijuana in a time of prohibition. *International Journal of Drug Policy*, *10*, 145–156.
- Grinspoon, L., & Bakalar, J.B. (1993). *Marijuana the forbidden medicine*. New Haven, CT: Yale University Press.
- Howard, J., Banks, S., Golinski, M., & Stinchcomb, A. (2011). Development of cannabidiol prodrugs for use with micro-needles for the treatment of alcohol use disorders. *21st Annual Symposium on the Cannabinoids* (pp. 3–18). Research Triangle Park, NC: International Cannabinoid Research Society.
- Hursh, S.R., Galuska, C.M., Winger, G., & Woods, J.H. (2005). The economics of drug abuse: A quantitative assessment of drug demand. *Molecular Interventions*, *5*, 20–28.
- Labigalini Jr, E., Rodrigues, L.R., & Da Silveira, D.X. (1999). Therapeutic use of cannabis by crack addicts in Brazil. *Journal of Psychoactive Drugs*, *31*, 451–455.
- Levin, F.R. (2006). Concurrent cannabis use during treatment for comorbid ADHD and cocaine dependence: Effects on outcome. *American Journal of Drug and Alcohol Abuse*, *32*, 629–635.
- Liput, D., Pendergast, M., & Nixon, K. (2011). Endocannabinoid modulation attenuates ethanol-induced neurodegeneration during withdrawal. *21st Annual Symposium on the Cannabinoids* (p. 32). Research Triangle Park, NC: International Cannabinoid Research Society.
- Lopez-Quintero, C., Hasin, D.S., de Los Cobos, J.P., Pines, A., Wang, S., Grant, B.F., & Blanco, C. (2011). Probability and predictors of remission from life-time nicotine, alcohol, cannabis or cocaine dependence: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Addiction*, *106*, 657–669.
- Los Angeles Times (2009). *No quick action seen on L.A. marijuana dispensaries*. Retrieved from <http://www.latimes.com/news/local/la-me-medical-marijuana4-2009nov04,0,4490002.story>
- Lucas, R.V. (2002). Victoria Registry No. 113701C, (Prov. Ct. B.C.; July 5, 2002).
- Lucas, P. (2008). Regulating compassion; an overview of Health Canada's medical cannabis policy and practice. *Harm Reduction Journal*, *5*, 5.
- Lucas, P. (2009). Moral regulation and the presumption of guilt in Health Canada's medical cannabis policy and practice. *International Journal of Drug Policy*, *20*, 296–303.
- Lucas, P. (2012). It can't hurt to ask; a patient-centered quality of service assessment of Health Canada's medical cannabis policy and program. *Harm Reduction Journal*, *9*, 2.
- Maitra, R., Bortoff, K., Pan, H., Reggio, P., & Seltzman, H. (2011). Inhibition of alcoholic hepatic steatosis by a Type 1 Cannabinoid receptor neutral antagonist. *21st Annual Symposium on the Cannabinoids* (p. 23). Research Triangle Park, NC: International Cannabinoid Research Society.
- Mikuriya, T. (2004). Cannabis as a substitute for alcohol: A harm reduction approach. *Journal of Cannabis Therapeutics*, *4*, 79–93.
- Model, K.E. (1993). The effect of marijuana decriminalization on hospital emergency drug episodes: 1975–1978. *Journal of the American Statistical Association*, *88*, 737–747.
- Moore, T.J., Cohen, M.R., & Furberg, C.D. (2007). Serious adverse drug events reported to the Food and Drug Administration, 1998–2005. *Archives of Internal Medicine*, *167*, 1752–1759.
- Muldoon, P., Lichtman, A., & Damaj, I. (2011). The role of 2-AG endocannabinoid neurotransmission in nicotine reward and withdrawal (2011). *21st Annual Symposium on the Cannabinoids* (pp. 3–24). Research Triangle Park, NC: International Cannabinoid Research Society.
- Nunberg, H., Kilmer, B., Pacula, R., & Burgdorf, J. (2011). An analysis of applicants presenting to a medical marijuana specialty practice in California. *Journal of Drug Policy Analysis*, *4*, 1.
- Perkonig, A., Goodwin, R.D., Fiedler, A., Behrendt, S., Beesdo, K., Lieb, R., & Wittchen, H.U. (2008). The natural course of cannabis use, abuse and dependence during the first decades of life. *Addiction*, *103*, 439–449.
- Ramesh, D., Owens, R., Kinsey, S., Cravatt, B., Sim-Selley, L., & Lichtman, A. (2011). Effects of chronic manipulation of the endocannabinoid system on precipitated opioid withdrawal. *21st Annual Symposium on the Cannabinoids* (pp. 3–22). Research Triangle Park, NC: International Cannabinoid Research Society.

- Reiman, A. (2006). *Cannabis care: Medical cannabis facilities as health service providers* (Dissertation). School of Social Welfare/Alcohol Research Group, University of California, Berkeley.
- Reiman, A. (2009). Cannabis as a substitute for alcohol and other drugs. *Harm Reduction Journal*, 6, 35.
- Schwartz, R. (2010). Medical marijuana users in substance abuse treatment. *Harm Reduction Journal*, 7, 3.
- Statistics Canada (2012). *Individuals by total income level, by province and territory*. Retrieved from <http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil105a-eng.htm>
- Substance Abuse and Mental Health Services Administration, (2007). *Results from the 2006 National Survey on Drug Use and Health: National Findings* (NSDUH Series H-32, DHHS Publication No. SMA 07-4293). Rockville, MD: Office of Applied Studies.
- United Nations Office for Drug Control and Crime Prevention (2001). *World drug report 2001* (pp. 30–32). Oxford: Oxford University Press.