No. T-2030-13

FEDERAL COURT

BETWEEN:

NEIL ALLARD
TANYA BEEMISH
DAVID HEBERT
SHAWN DAVEY

PLAINTIFFS

AND:

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

DEFENDANTS

AFFIDAVIT OF ZACHARY WALSH

I, ZACHARY WALSH, Ph.D., R. Psych, Associate Professor, Department of Psychology at the University of British Columbia of 3333 University Way, Kelowna, British Columbia Campus, MAKE OATH AND SAY AS FOLLOWS, THAT:

1. I am now an Associate Professor with the Department of Psychology at the University of British Columbia, Kelowna Campus, now produced and marked as Exhibit "A" to this my Affidavit is a copy of my current Curriculum Vitae.

2. Now produced and marked as Exhibit "B" to this my affidavit is a copy of an article recently published in the *International Journal of Drug Policy* after a blind peer review process, entitled "Cannabis for Therapeutic Purposes: Patient Characteristics, Access and Reasons for Use" that is the culmination of research by myself and the other authors/participants.

3. Now produced and marked as Exhibit "C" to this my affidavit is another paper that I have authored with others that has also been blind peer reviewed and has now been published in the *International Journal of Drug Policy* at Volume 25 (2014) 691-699 , entitled "Barriers to access for Canadians who use cannabis for therapeutic purposes" by myself and the other authors/participants mentioned accordingly.

4. Now produced and marked as Exhibit "D" to this my affidavit is a copy of a PowerPoint presentation entitled "Cannabis Access for Medical Purposes: Patient Characteristics, Patterns of Use and Barriers to Access". This study CAMPS is the largest study to date in Canada of medical cannabis (marihuana) consumers in Canada and was externally funded and reviewed by the UBC Institute for Healthy Living and Chronic Disease Prevention and was carried out between 2011 and 2012.

5. I believe the CAMPS survey is relatively self-explanatory by each slide or page illustrating the methods used, the demographics with respect to the individuals, the medical conditions for which cannabis has been authorized and for which unauthorized use continues, the medical condition systems indicated by the patients, the patterns of use by them, the various modes of access both authorized and unauthorized, obstacles to access including, physicians, affordability, availability and modes of access followed by a summary of the discussion engendered by these findings.

6. On the page dealing with 'affordability' in relation to access you will note that those in the lowest income groups had the most difficulty affording medicine with the graph indicating somewhere between 50% and 70% and also indicating that a large number of that group choose between obtaining their medicine and other necessities. The further graph on that page also demonstrates that those having the greatest difficulty affording their medicine are the most likely to choose between their medicine and other necessities are those in the poorest health.

7. In Exhibit "C" we define "barriers to access" as areas of poor fit between clients and services and used 5 dimensions to examine access to cannabis for therapeutic purposes, namely "accommodation, accessibility, availability, affordability and acceptability". As indicated in the abstract summary and results, our findings revealed that it was difficult for Canadians to find a physician to support their application, that access from unauthorized sources were common with only 7% of the Respondents accessing cannabis for therapeutic purposes exclusively from authorized sources and accessibility to such therapy was associated with the presence of medical cannabis dispensaries, even though they were excluded from the regulatory regime. Access also

varied by medical condition and general quality of health. Most significantly affordability was determined to be a significant barrier to access that we recommended should be addressed under future programs.

8. As indicated in Exhibit "C" an estimated 500,000 - 1,000,000 Canadians or 2 - 4% of those age 15 and older reported using cannabis to treat self-defined medical conditions in the previous 12 months. In 2001 the *Marihuana Medical Access Regulations (MMAR)* came into effect and we were advised that as of December 2012 there were 28,115 Canadians who had obtained authorizations under these Regulations to possess cannabis for therapeutic purposes and to obtain it from a legal source. We understood that while the uptake of the federal program has increased in recent years, its enrollment still only represents fewer than 5% of the estimated users of cannabis in Canada. This suggested to us that there were numerous barriers to access in existence which we undertook to analyze.

9. We determined in addition to authorized sources, there are medical cannabis dispensaries known as Compassion Clubs or Dispensaries that represent a parallel source of cannabis providing cannabis and related services apparently to over 40,000 patients in Canada according to the Canadian Association of Medical Cannabis Dispensaries in 2013. These dispensaries arose in Canada in 1997 in response to demand and predate the Regulations and are not officially recognized by them. In addition, apparently many Canadians access cannabis through friends, illicit self-production and the street market. Our analysis drew on the data from the largest survey of Canadians who use cannabis for therapeutic purposes, namely the *Cannabis Access for Medical Purposes Survey (CAMPS)* and we employed a Health Services analytical framework to define the concept of "access" and its relationship to patient satisfaction and to examine barriers to access under the program. As mentioned above, we focused on five dimensions, which are summarized at page 693 of the paper and focusing on the question of "affordability" we set out that such reflected the relationship between the costs of services and products and the patient's willingness and ability to pay for them and we addressed this dimension by examining associations among

income, costs associated with cannabis for therapeutic purposes and the ability to access cannabis.

10. We conducted a literature review on the barriers to access to cannabis therapy in Canada noting few studies touching on this issue and pointing to a 2005 study by the Canadian AIDS Society that found over 1/3 of the patients had applied to participate in the federal program, but with many of them describing significant barriers. Apparently 86% of respondents obtained their cannabis from illegal sources, including friend, dispensaries and unauthorized self-cultivation as well as street dealers. Only 8% had licences to produce their own and 4% had a designated grower with fewer than 2% purchasing from Health Canada. A more recent survey reported similar low levels of obtaining cannabis from Health Canada and high levels via dispensaries and licenced self-cultivation while the Respondents were generally highly satisfied with the overall federal program (page 692).

11. The results of the study commence at page 693 referring to the issue of accommodation (page 694); accessibility (pages 694-695); availability (pages 695-696); affordability (pages 696-697); and acceptability (page 697).

12. On the question of "availability" we determined that with regard to sources of cannabis almost 1/3 of the respondents reported self-producing of whom 50% were licenced to produce for personal use. Approximately 1/3 of those who self-produced reported difficulties in learning to produce. Among those who did not self-produce the most prominent reason for not producing was lack of space, expense or legal concerns. However, among self-producers the most important reason for self-producing was quality (39%), followed by price (36%), avoiding the black market (29%), selection of a specific strain of cannabis (24%) and safety (12%). Of those who reported that someone else produced for them, 67% had designated producers who were licenced to produce for them.

13. On the question of affordability, while many applicants were charged a fee by their physicians for the service of having their application completed, it was determined that it was the actual cost of the cannabis that was the major barrier to access in terms of

affordability. Among the participants who reported buying cannabis the median amount reportedly spent was $200 a month. However, 54% of the respondents reported that there were sometimes or never able to afford to buy sufficient quantity of cannabis to relieve their symptoms and approximately 1/3 reported that they often or always choose between cannabis and other necessities (e.g. food, rent, other medicines) because of lack of money. The proportions of respondents who reported that they were sometimes or never able to afford sufficient quantity of cannabis differed according to income such that it was most frequently report by the lower income group (72%) and least frequently by the higher income group (30%). We found that the frequency of reports of choosing between cannabis therapy and other necessities followed a similar pattern with the highest level amongst lower income people and the lowest level amongst higher income people. Approximately two thirds of those experiencing fair to poor general health were sometimes or never able to afford sufficient cannabis compared to half of those with better health. Those with poorer health were also nearly twice as likely to report choosing between cannabis and other necessities.

14. We discuss again the question of "affordability" at page 698 and indicate that we found further obstacles to optimal cannabis use with over ½ the respondents indicating that financial considerations interfered with their ability to treat symptoms with cannabis. Lower income individuals were the most vulnerable with approximately ½ the participants in the lowest income group reporting having to choose between cannabis and other necessities. Even 1/3 of the highest income group reported difficulties affording cannabis. Affordability appeared to disproportionately impact the most seriously ill patients so the group who reported fair to poor health were twice as likely as healthier patients to report having to choose between cannabis and other necessities. While the lowest income group was the most likely to obtain an Authorization to Possess, it was not the cost of the Authorization but the cost of the cannabis that presented the primary barrier to affordability. Consequently we concluded that this financial strain across all income barriers demonstrated the need for developing approaches to mitigate financial barriers and integrate cannabis therapy within a subsidized medicine framework.

15. We concluded (page 698) that "affordability" of cannabis for therapeutic purposes remains a significant barrier for many Canadians and especially the most seriously ill. We note based on our information with respect to the new *Marihuana for Medical Purposes Regulations* that Canadians who use cannabis for therapeutic purposes will no longer have the cost effective option of producing their own cannabis or designating a producer and that the move to commercial Licenced Producers will increase the price of cannabis as indicated by the government's regulatory impact analysis statement regarding the new *MMPR* (Government of Canada 2012). The background paper in support of the Regulatory Impact Analysis Statement was completed by Delsys Research Group Inc. in December 2012 and is entitled "Cost Benefit Analysis of Regulatory Changes for Access to Marihuana for Medical Purposes". Now produced and marked as Exhibit "E" to this my affidavit is a copy of that final report of December 2012.

16. In summary, the government cost benefit analysis makes it clear that a major change under the new program is a projected significant price increase which will therefore significantly impact upon the patients to an even greater degree as indicated in the CAMPS survey and that data resulting therefrom with respect to "affordability" as the most significant barrier to access for the largest group.

17. Now produced and marked as Exhibit "F" to this my Affidavit is a copy of my Expert Report.

18. I swear this Affidavit in support of being called as an expert witness on behalf of the Plaintiffs in these proceedings.

SWORN BEFORE ME at the City of Kelowna, in the Province of British Columbia, this 29 day of October, 2014

A Commissioner for Taking Affidavits in and for the Province of British Columbia

ZACHARY WALSH

CURRICULUM VITAE
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This is Exhibit "A" referred to in the affidavit of ZACHARY WALSH sworn before me at Kelowna, this 29 day of October, 2014

A Commissioner for taking Affidavits In British Columbia

EDUCATION

2008 Ph.D., Clinical Psychology
Rosalind Franklin University/ Chicago Medical School, North Chicago, IL.
Dissertation: *Psychopathy, ethnicity, SES and violence: A further examination.*
Supervisor: David S. Kosson, Ph.D.

2004 M.S., Psychology
Rosalind Franklin University/ Chicago Medical School, North Chicago, IL.
Thesis: *The impact of socioeconomic status, ethnicity, and psychopathy on recidivism in a county jail population.*
Supervisor: David S. Kosson, Ph.D.

2001 B.A. (Honours), Psychology
University of Winnipeg, Winnipeg, MB.
Thesis: *The effects of expectations of reminders and action-state orientation on prospective memory.*
Supervisors: Evelyn Schaefer, Ph.D. & Ross Broughton, Ph.D.

1997 B.Ed., English
University of Winnipeg, Winnipeg, MB.

POSTGRADUATE TRAINING

2008 - 2009 Postdoctoral Research Fellowship, Brown University, Warren Alpert Medical School, Department of Psychiatry & Human Behavior, Providence, RI.

2007 - 2008 Clinical Psychology Internship, Brown University, Clinical Psychology Training Consortium, Providence, RI.

PROFESSIONAL LICENSURE

2012 - College of Psychologists of British Columbia -
Registered Clinical Psychologist #2011

2008 - 2010 Psychological Association of Manitoba -
Clinical Psychologist - Candidate

ORIGINAL PUBLICATIONS IN PEER-REVIEWED JOURNALS
(underline indicates supervised student authorship)

Kosson, D.S., **Walsh, Z.,** Rosenthal, M.Z., & Lynch, T.R. *(in press).* Interpersonal assessment of Borderline Personality Disorder: Preliminary findings. *Journal of Personality Assessment.*

Swogger, M.T., **Walsh, Z.,** Christie, M., Priddy, B.M., & Conner, K.R. *(in press).* Instrumental versus reactive aggression in the prediction of violent criminal recidivism. *Aggressive Behavior.*

Fitzcharles, M., Ste-marie, P.A., Clauw, D.J., Jamal, S., Karsh, J., Leclercq, S., McDougall, J.J., Shir, Y., Shojania, K.,& **Walsh, Z.** *(in press).* Rheumatologists lack confidence in their knowledge of cannabinoids pertaining to the management of rheumatic complaints. *BMC Musculoskeletal Disorders.*

Belle-Isle, L.*, **Walsh, Z.***, Lucas, P., Callaway, R., Capler, R., Kay, R., & Holtzman, S. (2014). Barrier to access for Canadians who use cannabis for therapeutic purposes. *International Journal of Drug Policy, 25,* 691-699. * *co-lead authors*

Roemer, A., & **Walsh, Z.** (2014). Where you live matters: The roles of living arrangement and self-esteem on college students' hazardous drinking behaviors. *Addiction Research and Therapy*. Advance online publication. doi:10.3109/16066359.2013.877454.

Swogger, M.T., **Walsh, Z.,** Maisto, S.A., & Conner, K.R. (2014). Reactive and proactive aggression and suicide attempts among criminal offenders. *Criminal Justice & Behavior, 41,* 337-344.

Walsh, Z., Callaway, R., Belle-Isle, L., Capler, R., Kay, R., Lucas, P., & Holtzman, S. (2013). The Cannabis Access for Medical Purposes Study: Patient characteristics, reasons for use, and modes of access. *International Journal of Drug Policy, 24,* 511-516.

Walsh, Z. (2013). Psychopathy and criminal violence: The moderating effect of ethnicity. *Law & Human Behavior, 37,* 303-311.

Walsh, Z., Shea, M.T., Yen, S., Edelen, M.O., Hopwood, C.J., Markowitz, J.C., Ansell, E.B., Morey, L.C., Grilo, C.M., Sanislow, C.A., Skodol, A.E., Gunderson, J.G., Zanarini, M.C.,& McGlashan, T.H. (2012). Socioeconomic-status and mental health in a personality disorder sample: The importance of neighbourhood factors. *Journal of Personality Disorders, 26,* 1-12.

Swogger, M.T., **Walsh, Z.,** Kosson, D.S., Cashman-Brown, S., & Caine, E.D. (2012). Self-reported childhood physical abuse and perpetration of intimate partner violence: The moderating role of psychopathic traits. *Criminal Justice & Behavior, 39,* 910-922.

Swogger, M.T., **Walsh, Z.**, Homaifar, B.Y., Caine, E.D., & Conner, K.R. (2012). Predicting self- and other-directed violence among discharged psychiatric patients: The roles of anger and psychopathic traits. *Psychological Medicine, 42,* 371-379.

Swogger, M.T., Conner, K.R., **Walsh, Z.**, & Maisto, S.A. (2011). Childhood abuse and harmful substance use among male and female criminal offenders. *Addictive Behaviors, 36,* 1205-1212.

Chatav-Schonbrun, Y., **Walsh, Z.**, Stuart, G.L., & Strong, D. (2011). Marital status and treatment seeking for alcohol use disorders. *Addictive Disorders and Their Treatment*, 10, 111-122.

Yen, S., Shea, M.T., **Walsh, Z.**, Edelen, M.O., Hopwood, C. J., Markowitz, J. C., Ansell, E. B., Morey, L.C., Grilo, C.M., Sanislow, C.A., Skodol, A.E., Gunderson, J.G., Zanarini, M.C., McGlashan, T.H. (2011). Self-harm subscale of the Schedule of Nonadaptive and Adaptive Personality (SNAP): Predicting suicide attempts over 8 years of follow-up. *Journal of Clinical Psychiatry, 72,* 1522-1528.

Walsh Z., Swogger, M.T., O' Connor, B.P., Stuart, G.L., Shea, M.T., & Chatav, Y. (2010). Psychopathy and subtypes of partner violent men and women. *Journal of Abnormal Psychology, 119,* 563-574.

Swogger, M.T., **Walsh, Z.**, Lejuez, C.J., & Kosson, D.S. (2010). Psychopathy and risk-taking among criminal offenders. *Criminal Justice and Behavior, 37,* 439-452.

Swogger, M.T., **Walsh, Z.**, Houston, R.J., Cashman-Brown, S., & Conner, K.R. (2010). Psychopathy and Axis I psychiatric disorders among criminal offenders: Relationships to impulsive and proactive aggression. *Aggressive Behavior, 36,* 45-53.

Walsh, Z., Swogger, M.T., & Kosson, D.S. (2009). Psychopathy and instrumental violence: Facet level relationships. *Journal of Personality Disorders, 23,* 416-424.

Stuart, G.L., O'Farrell, T.J., Leonard, K., Moore, T.M., Temple, J.R., Ramsey, S.E., Stout, R., Kahler, C., Bucossi, M., Andersen, S., Recupero, P., **Walsh, Z.**, Chatav, Y., Strong, D., Rothman, E., Rhatigan, D., & Monti, P. (2009). Examining the interface between substance misuse and intimate partner violence. *Substance Abuse: Research and Treatment, 3,* 25-29.

Swogger, M.T., **Walsh, Z.**, & Kosson, D.S. (2008). Psychopathy subtypes among African American county jail inmates. *Criminal Justice and Behavior, 35,* 1484-1499.

Walsh, Z., & Kosson, D.S. (2008). Psychopathy and violence: The importance of factor level interactions. *Psychological Assessment, 20,* 114-120.

Walsh, Z., Epstein, A.M., Munisamy, G., & King, A.C. (2008). The impact of depressive symptoms on the efficacy of naltrexone in smoking cessation. *Journal of Addictive Diseases, 27,* 65-72.

Swogger, M.T., **Walsh, Z.**, & Kosson, D.S. (2007). Domestic violence and psychopathic traits: Distinguishing the antisocial batterer from other antisocial offenders. *Aggressive Behavior, 33,* 253-260.

Walsh, Z., Allen, L.C., & Kosson, D.S. (2007). Beyond social deviance: Substance-specific relationships with PCL-R facets. *Journal of Personality Disorders, 21,* 273-288.

Walsh, Z., Swogger, M.T., Walsh, T., & Kosson, D.S. (2007). Psychopathy and violence: Increasing specificity. *Netherlands Journal of Psychology, 63,* 136-143.

Walsh, Z., & Kosson, D.S. (2007). Psychopathy and violence: A prospective study of the influence of socioeconomic status and ethnicity. *Law and Human Behavior, 31,* 209 -229.

Walsh, Z., & Walsh, T. (2006). The evidentiary introduction of PCL-R assessed psychopathy in U.S. courts: Extent and appropriateness. *Law and Human Behavior, 30,* 493-507.

Walsh, Z., Swogger, M.T., & Kosson, D.S. (2004). Psychopathy, IQ and violence in European American and African American county jail inmates. *Journal of Consulting and Clinical Psychology, 72*, 1165-1169.

REVIEWED PUBLICATIONS IN EDITED VOLUMES

Allan, J., Holder, M.D., & **Walsh, Z.** (*in press*) Cannabis and well-being. Preedy, V.R. (Ed.). *The Handbook of Cannabis and Related Pathologies: Biology, Diagnosis, Treatment and Pharmacology*. Amsterdam, Netherlands: Elsevier.

Baker, A., Black, P.J., **& Walsh, Z** (*in press*). Deception. In Arrigo, B.A. & Golson, G. (Eds.). *Encyclopedia of Criminal Justice Ethics*. Thousand Oaks, CA: Sage Publications.

Black, P.J., **& Walsh, Z** (*in press*). Police profiling. In Arrigo, B.A. & Golson, G. (Eds.). *Encyclopedia of Criminal Justice Ethics*. Thousand Oaks, CA: Sage Publications.

Crosby, K., Hiles, M., & **Walsh, Z.** (*in press*). The war on drugs. In Arrigo, B.A. & Golson, G. (Eds.). *Encyclopedia of Criminal Justice Ethics*. Thousand Oaks, CA: Sage Publications.

Langille, J.I., Peters, L. & **Walsh, Z.** (*in press*). Violence against women and girls. In Arrigo, B.A. & Golson, G. (Eds.). *Encyclopedia of Criminal Justice Ethics*. Thousand Oaks, CA: Sage Publications.

Peters, L. & **Walsh, Z.** (*in press*). Drug courts. In Arrigo, B.A. & Golson, G. (Eds.). *Encyclopedia of Criminal Justice Ethics*. Thousand Oaks, CA: Sage Publications.

Hare, R.D., Black, P.J., **& Walsh, Z.** (2013). The PCL-R: Forensic applications and limitations In R. P. Archer (Ed.). *Forensic use of clinical assessment instruments, Second Edition.* (pp.230-265) Mahwah, NJ: Lawrence Erlbaum.

Stuart, G.L., Chatav Schonbrun, Y., & **Walsh, Z.** (2009). Treatment for substance abuse reduces intimate partner violence. DATA: *The Brown University Digest of Addiction Theory and Application, 28,* 8.

Walsh, Z., & Stuart, G.L. (2009). Antisocial Personality Disorder as a co-occurring disorder with Substance Use Disorder. In G.L. Fisher & N. A.Roget (Eds.). *Encyclopedia of Substance Abuse Prevention, Treatment, and Recovery* (pp.92-95). Thousand Oaks, CA: Sage Publications.

Walsh, Z., & Stuart, G.L. (2009). Experimental substance use. In G.L. Fisher & N.A. Roget (Eds.), *Encyclopedia of Substance Abuse Prevention, Treatment, and Recovery* (pp. 389-391). Thousand Oaks, CA: Sage.

Walsh, Z., & Stuart, G.L. (2009). Moderation in use. In G.L. Fisher & N.A. Roget (Eds.), *Encyclopedia of Substance Abuse Prevention, Treatment, and Recovery* (pp. 554-555). Thousand Oaks, CA: Sage.

Walsh, T., **Walsh, Z.**, & Stuart, G.L. (2009). Decriminalization. In G.L. Fisher & N.A. Roget (Eds.), *Encyclopedia of Substance Abuse Prevention, Treatment, and Recovery* (pp. 263-266). Thousand Oaks, CA: Sage.

Walsh, T., **Walsh, Z.**, & Stuart, G.L. (2009). History of drug use laws. In G.L. Fisher & N.A. Roget (Eds.), *Encyclopedia of Substance Abuse Prevention, Treatment, and Recovery* (pp. 327-330). Thousand Oaks, CA: Sage.

ABSTRACTS & PRESENTATIONS

Walsh, Z., Crosby, K., Lozenski, K. & Holtzman, S. (2014) *Cannabis, anxiety and pain: The importance of coping style.* Talk presented at the meeting of the International Cannabinoid Research Society, Baveno, Italy.

Lucas. P., **Walsh, Z.**, Crosby, K., Callaway, R., Belle-Isle, L., Capler, R., Holtzman, S., & Kay, B. (2014). *Substitution effects in medical cannabis patients: Results from the Cannabis Access for Medical Purposes Study.* Talk presented at the meeting of the International Cannabinoid Research Society, Baveno, Italy.

Crosby, K. & **Walsh, Z.** (2014) *Cannabis use and perpetration of intimate partner violence: The moderating role of problematic alcohol use.* Poster presented at the meeting of the International Cannabinoid Research Society, Baveno, Italy.

Walsh, Z. (2014). *The combined influence of alcohol dependence and psychopathy on perpetration of intimate partner violence: Prospective evidence from a jail sample.* Talk presented at the meeting of the Canadian Psychological Association, Vancouver, BC.

Carroll, C., Crosby, K., **Walsh, Z.** & Woodworth, M. (2014). *A deeper look into cannabis use: Pinpointing schizotypal personality traits related to cannabis abuse and dependence.* Poster presented at the meeting of the Canadian Psychological Association, Vancouver, BC.

Crosby, K., Carroll, C., Lozenski, K., & **Walsh, Z.** (2014). *An examination of broad and narrow band constructs of negative affect among cannabis users*. Poster presented at the meeting of the Canadian Psychological Association, Vancouver, BC.

Lozenski, K., Crosby, K., Langille, J.I., & **Walsh, Z.** (2014). *Alcohol use accounts for the relationship between cannabis use and perpetration of intimate partner violence* . Poster presented at the meeting of the Canadian Psychological Association, Vancouver, BC.

MacLean, S., Langille, J.I., Crosby, K., & **Walsh, Z.** (2014). *Depression and anxiety in victims of intimate partner violence: The role of self-esteem and belongingness social support.* Poster presented at the meeting of the Canadian Psychological Association, Vancouver, BC.

Boulier, K., Langille, J.I., Crosby, K., & **Walsh, Z.** (2014). *Psychopathy, non-suicidal self-injury and intimate partner violence: Predicting self and other-directed violence.* Poster presented at the meeting of the Canadian Psychological Association, Vancouver, BC.

Walsh, Z., Crosby, K., Carroll, C., & Lozenski, K. (2014). *Coping motives partially mediate the relationship between delusional ideation and cannabis-related problems.* Poster presented at the meeting of American Psychological Society, San Francisco, CA.

Timoney, L.S. &**Walsh, Z.** (2014). *The five-factor model of personality and life events in a personality disorder sample.* Poster presented at the meeting of American Psychological Society, San Francisco, CA.

Walsh, Z., Swogger, M.T., & Crosby, K. (2013). *Cannabis use motives across contexts: Differences and similarities between college and correctional samples.* Poster presented at the annual Addiction Health Services Research meeting, Portland, OR.

Swogger, M.T., Hart, E., Priddy, B., Murray, T., Erowid, F., Erowid, E. & **Walsh, Z.** (2013). *Experiences of kratom users: A qualitative analysis.* Poster presented at the annual Addiction Health Services Research meeting, Portland, OR.

Capler, R., Balneaves, L., **Walsh, Z.,** Bottorff, J., Belle-Isle, L., Callaway, R. (2013). *HEMMP team and CAMPS team. Cannabis for therapeutic purposes, physicians as gatekeepers, and the patient- physician relationship.* Talk presented at the Family Medicine Forum, Vancouver, BC.

Walsh, Z., Callaway, R., Belle-Isle, L., Capler, R., Kay, B., Lucas, P. & Holtzman, S. (2013). *Cannabis Access for Medical Purposes Survey: Patient characteristics, reasons for use and modes of access.* Talk presented at Symposium of the International Cannabinoid Research Society, Vancouver, BC.

Lucas, P., Crosby, K., Hiles, M., Swogger, M. T., & **Walsh, Z.** (2013). *Substance use among medical cannabis users: Substituting cannabis for alcohol and other substances.* Poster presented at the 75th Annual Scientific Meeting of the College on Problems of Drug Dependence. San Diego, CA.

Hiles, M., Crosby, K., Swogger, M. T., & **Walsh, Z.** (2013). *Cannabis use motives and frequency of use: Combined and distinct associations with cannabis use problems.* Poster presented at the 75th Annual Scientific Meeting of the College on Problems of Drug Dependence (CPDD). San Diego, CA.

Walsh, Z., Belle-Isle, L., Callaway, R., Capler, R., Kay, B., Lucas, P., Holtzman, S., Crosby, K. & Atkinson, B. (2013). *Use of cannabis to treat symptoms of anxiety and depression: Results from a survey of medical cannabis users.* Poster presented at meeting of Multidisciplinary Association for Psychedelic Studies, Oakland, CA.

Wafler, J. M., **Walsh, Z.**, Woodworth, M., & Porter, S. (2013). *The Okanagan General Remorse Exam (OGRE): Preliminary validation.* Poster presented at the meeting of the American Psychology-Law Society, Portland, OR.

Peters, L. R., Langille, J. I., Blanco Carranza, A., Okano, M., & **Walsh, Z.** (2013). *Bidirectional versus unidirectional violence: The roles of psychopathy and personality.* Poster presented at the meeting of American Psychology-Law Society, Portland, OR.

Walsh, Z., Callaway, R., Belle- Isle, L., Capler, R., Kay, R., Lucas, P., Stratton, T., Swogger, M.T. (2012). *Medical cannabis: Incentives and barriers among a Canadian sample*. Poster presented at Addiction Health Services Research Conference, New York, NY.

Erickson, K., Langille, J.I. & **Walsh, Z.** (2012). *Who's to blame? Gender roles and victim blaming in intimate partner violence.* Poster presented at the meeting of Canadian Psychological Association, Halifax, NS.

Roemer, A., Crosby, K. & **Walsh, Z.** (2012). *Psychopathic traits, alcohol use and female perpetration of intimate partner violence.* Poster presented at the meeting of American Psychological Society, Chicago, IL.

Krank, M.D., Goldstein, A., **Walsh, Z.** & Stewart, S. (2012). *Prevention targeting individualized misperceptions of peer use of alcohol and marijuana in a general middle school population.* Poster presented the meeting of the Research Society on Alcoholism, San Francisco, CA.

Roemer, A. & **Walsh, Z.** (2012). *Where you live matters: The role of living arrangement on self-esteem and hazardous drinking behaviors.* Poster presented the meeting of the Research Society on Alcoholism, San Francisco, CA.

Carranza, A.B., **Walsh, Z.** & Swogger. M.T. (2012). *Self-directed violence and IPV perpetration: The roles of psychopathy and emotion dysregulation.* Poster presented at the Intimate Partner Violence: Innovations in the Field Conference, Department of Psychiatry, University of Rochester, Rochester, NY.

Swogger, M.T., **Walsh, Z,** Maisto, S.A. & Connor, K.R. (2011). *Harmful alcohol use moderates the link between proactive aggression and suicide attempts among criminal offenders*. Poster presented at Addiction Health Services Research Conference, Fairfax, VA.

Walsh, Z. (2011). *Psychopathy socio-economic status and criminal violence: Evidence consistent with social push.* Poster presented at the North American Correctional and Criminal Justice Psychology Conference, Toronto, ON.

Urch, G., **Walsh, Z.**, & Roemer, A., (2011). *Individual differences among perpetrators of violence against children: Negative affect and subcomponents of the psychopathic personality.* Poster presented at the conference of the Canadian Psychological Association, Toronto, ON.

Roemer, A., **Walsh, Z.**, Urch, G., & Wallace, G. (2011). *Pathways to college drinking: Gender differences in the association between parental bonds and hazardous alcohol use.* Poster presented at the conference of the Canadian Psychological Association, Toronto, ON.

Edalati, H., & **Walsh, Z.** (2011). *Psychopathy and emotional dot probe: Selective attention to happy faces.* Poster presented at the conference of the Society for the Scientific Study of Psychopathy, Montreal, PQ.

Walsh, Z., & Swogger, M. T. (2011). *Predicting self-directed and other directed violence: The roles of psychopathic traits.* Poster presented at the conference of the Society for the Scientific Study of Psychopathy, Montreal, PQ.

Langille, J. I., & **Walsh, Z.** (2011). *Psychopathy predicts intimate partner violence perpetration across gender.* Poster presented at the conference of the Society for the Scientific Study of Psychopathy, Montreal, PQ.

Urch, G., & **Walsh, Z.** (2010). *Psychopathy and violence against children: Factor level relationships.* Poster presented at the conference of the International Society for Justice Research, Banff, AB.

Walsh, Z. (2010). *Psychopathy and criminal violence - The moderating effects of ethnicity.* Talk presented at the meeting of the American Psychology and Law Society, Vancouver, BC.

Swogger, M.T., & **Walsh, Z.** (2010). *Childhood abuse and substance use consequences among male and female criminal offenders.* Poster presented at the meeting of the American Psychology and Law Society, Vancouver, BC.

Manning, J., **Walsh, Z.,** & Cioe, J. (2010). *Psychopathy, substance use and stress.* Poster presented at the meeting of the American Psychology and Law Society, Vancouver, BC.

Swogger, M. T., Conner, K. R., **Walsh, Z.,** & Caine, E. D. (2010). *Testing traits of personality disorders as moderators of treatment efficacy among criminal offenders.* Abstract published in *Clinical and Translational Science, 3,* A-077.

Swogger, M. T., **Walsh, Z.,** Cashman-Brown, S., Houston, R. J., & Conner, K. R. (2009). *Psychopathy, Axis I Disorders, and Subtypes of Aggression among Criminal Offenders.* Poster presented at the meeting of the American Psychological Association, Toronto, ON.

Walsh, Z. (2009). *The influence of ethnicity and neighborhood factors on the predictive power of psychopathy for violence: Social push or social potentiation?* Talk presented at the meeting of the Society for the Scientific Study of Psychopathy, New Orleans, LA.

Swogger, M. T., **Walsh, Z.,** & Conner, K. R. (2009). *Predicting self-directed versus other-directed violence: The roles of anger and psychopathic traits.* Poster presented at the meeting of the Society for the Scientific Study of Psychopathy, New Orleans, LA.

Walsh, Z., Swogger, M. T., Chatav, Y., & Stuart, G. L. (2009). *Alcohol use and interpersonal violence: The importance of perpetrator subtypes.* Talk presented at the meeting of the Research Society on Alcoholism, San Diego, CA.

Walsh, Z., Swogger, M.T., Chatav, Y., & Stuart, G.L. (2008). *Psychopathy and subtypes of partner violent men and women.* Poster presented at the meeting of the Association for Behavioral and Cognitive Therapy, Orlando, FL.

King, A. C., **Walsh, Z.,** Munisamy, G., & Epstein, A. M. (2007). *The impact of depressive symptoms on the efficacy of naltrexone in smoking cessation.* Talk presented at the meeting of the American Psychosomatic Society, Budapest, Hungary.

Kosson, D. S., Allen, L., McBride, C. K., **Walsh, Z.,** Tercek, R., & Greco, J. (2007). *Preliminary evidence for negative affectivity and maladaptive emotion regulation strategies in youth with psychopathic traits.* Talk presented at the meeting of the Society for the Scientific Study of Psychopathy, St. Petersburg, FL.

Walsh, Z., & Kosson, D. S. (2007). *Psychopathy and terror management: Impact on perceptions of blue-collar and white-collar criminality.* Talk presented at the meeting of the Society for the Scientific Study of Psychopathy, St. Petersburg, FL.

Kosson, D. S., **Walsh, Z.,** & Swogger, M. T. (2007). *Psychopathy, crime, & violence: What we know and what we don't know.* Invited talk presented to the Department of Criminal Sciences, Pontificia Universidade Catolica do Rio Grande do Sul, Brazil.

Walsh, Z., Stuart, G., & Shea, M. T. (2007). *Psychopathy and intimate partner violence: The moderating effect of substance use treatment.* Poster presented at the meeting of the Association for Behavioral and Cognitive Therapy, Philadelphia, PA.

Walsh, Z., & Kosson, D. S. (2006). *Psychopathy and violence: Two factors are still better than one.* Talk presented at the meeting of the American Psychology and Law Society, St. Petersburg, FL.

Swogger, M., **Walsh, Z.**, & Kosson, D. S. (2006). *Domestic violence and psychopathic traits: Distinguishing the antisocial batterer from other antisocial offenders.* Talk presented at the meeting of American Psychology and Law Society, St. Petersburg, FL.

Walsh, Z., Allen, L. C., & Kosson, D.S. (2005). *Beyond social deviance: Substance-specific relationships with PCL-R facets.* Talk presented at the meeting of the American Psychology and the Law Society, San Diego, CA.

Walsh, Z., & Kosson, D. S. (2005). *Schematic processing in psychopathic and antisocial criminals: Mistrust, grandiosity and criminality.* Talk presented at the meeting of the Society for the Scientific Study of Psychopathy, Vancouver, BC.

Kosson, D. S., **Walsh, Z.**, Hoffmann, E. & Suchy, Y. (2005). *Left hemisphere activation deficits mediate relationships between psychopathy and antisocial behavior.* Talk presented at the meeting of the Society for the Scientific Study of Psychopathy, Vancouver, BC.

Walsh, Z., Brook, M., & Kosson, D. S. (2005). *Psychopathy and violence: Two factors are still better than one.* Poster presented at the meeting of the Society for the Scientific Study of Psychopathy, Vancouver, BC.

Munisamy, G., Epstein, A. M., **Walsh, Z.**, & King, A. C. (2005). *Higher sensation seeking predicts smoking relapse.* Poster presented at the meeting of the Society of Behavioral Medicine, Boston, MA.

Walsh, Z., Swogger, M. T., & Kosson, D. S. (2004). *Psychopathy, depression, and violence: The moderating role of rumination.* Poster presented at the meeting of the Society for Research in Psychopathology. St. Louis, MO.

Walsh, Z., Allen, L. C., Sullivan, E. A., & Kosson, D. S. (2004). *Beyond general social deviance: Substance-specific relationships with Psychopathy Checklist-Revised (PCL-R) facets.* Poster presented at the meeting of American Psychological Society, Chicago, IL.

Walsh, Z., & Kosson, D. S. (2004). *Psychopathy and recidivism in a county jail: The impact of ethnicity and socioeconomic status.* Poster presented at the meeting of the American Psychology and the Law Society, Scottsdale, AZ.

Swogger, M., **Walsh, Z.**, & Kosson, D. S. (2004). *Psychopathy and domestic battery: Relationship to the four-facet model.* Poster presented at the meeting of the American Psychology and Law Society, St. Petersburg, FL.

Walsh, Z., Swogger, M. T., & Kosson, D. S. (2003). *Instrumental and reactive violence in psychopathic and nonpsychopathic violent offenders*. Poster presented at the meeting of the Society for Research in Psychopathology, Toronto, ON.

Walsh, Z., Swogger, M. T., & Kosson, D. S. (2003). *Psychopathy, head injury and child abuse: Predicting violent crime.* Poster presented at the meeting of Developmental and Neurosciences Perspectives on Psychopathy, Madison, WI.

Walsh, Z., Kosson, D. S., & Sullivan, E.A. (2002). *Psychopathy, I.Q., and violence.* Poster presented at the meeting of the Society for Research in Psychopathology, San Francisco, CA.

INVITED PRESENTATIONS

Walsh, Z. (2014). *The mental health risks and harms of cannabis.* Invited witness presentation to the House of Commons Standing Committee on Health: Study on Marijuana's Health Risks and Harms, Ottawa, ON.

Walsh, Z. (2014). *Cannabis and public health: New perspectives.* Invited talk at UBC President's Research Lunch, Kelowna, BC.

Walsh, Z. (2014). *Cannabis and public health.* Invited talk at Uruguayan National Office of Drugs and Ministry of Public Health International Forum: Update on the medical and therapeutic uses of cannabis, Montevideo, Uruguay.

Walsh, Z., Belle-Isle, L., Callaway, R., Lucas, P., Capler, R., Kay, B., Stratton, T., & Holtzman, S. (2014). *Patient perspectives on the therapeutic use of cannnabis.* Invited talk at Uruguayan National Office of Drugs and Ministry of Public Health International Forum: Update on the medical and therapeutic uses of cannabis, Montevideo, Uruguay

Walsh, Z. (2014). *Making peace with cannabis.* Invited TED talk at TEDx -Penticton, Penticton, BC.

Walsh, Z. & Crosby, K. (2014).*Cannabis and arthritis*. Invited talk at UBC Institute for Healthy Living and Chronic Disease Prevention/ Interior Health Authority Partnership in Research Seminar, Kelowna, BC.

Crosby, K., Lozenski, K. & **Walsh, Z.** (2014).*Cannabis and arthritis*. Invited talk at Move It and Mingle Seniors Group, Army, Navy, and Air Force Club, Vernon, BC.

Walsh, Z. (2013). *Cannabis: Aspirin of the 21st Century?* Invited talk at Annual Meeting of UBC Board of Governors - Learning and Research Subcommittee, Kelowna, BC.

Belle-Isle, L., **Walsh, Z.**, Callaway, R., Lucas, P., Capler, R., Kay, B., Stratton, T., & Holtzman, S. (2013). *Cannabis Access for Medical Purposes Survey: Preliminary Findings on Barriers to Access.* Invited talk presented at BC Ministry of Health - Health Services and Health Policy Research Priorities Meeting, Victoria, BC.

Walsh, Z. (2012). *One Size Does Not Fit All: Psychopathy and Subtypes of Partner Violence Perpetrators.* Invited keynote lecture at the Intimate Partner Violence: Innovations in the Field Conference, Department of Psychiatry, University of Rochester, Rochester, NY.

Walsh, Z. & Callaway, R. (2012). *Barriers to accessing cannabis among individuals with chronic illness*. Invited talk at UBC Institute for Healthy Living and Chronic Disease Prevention/ Interior Health Authority Partnership in Research Seminar, Kelowna, BC.

Walsh, Z. & Capler, R. (2012). *Medical Cannabis: Standards Engagement, Evaluation and Dissemination (SEED).* Invited talk at the Peter Wall Solutions Initiative Grantee Celebration, Peter Wall Institute of Advanced Studies, University of British Columbia, Vancouver, BC.

GRANTS

Ongoing:

2014 - **Supervisor** - *Social Sciences and Humanities Research Council.* Joseph-Armand Bombardier Master's Scholarship "An Examination of the Associations Between Problematic Substance Use and Experiences of Intimate Partner Violence" $17,500. Student awardee: Kimberly Crosby.

2014 - **Primary Partner** - *BC Alliance for Mental Health/ Illness and Addictions – Community Action Initiative* Service Innovation Grant "Caring for the Caregivers" $200,000. Principal awardees: Canadian Mental Health Association, The Bridge - Youth and Family Services.

2014 - **Mentor** - *Intersections of Mental Health Perspectives in Addictions Research Training.* Master's Fellowship "Substance Use and Intimate Partner Violence" $18,000. Student awardee: Kimberly Crosby.

2014 - **Consultant** - *University of Rochester Medical Center Office of Health Promotion.* Community Partnership Development Award "Assessing the Effectiveness of a Program for Perpetrators of Intimate Partner Violence" $20,000. Principal investigator: Marc T. Swogger, Ph.D.

2013 - **Principal Investigator** - *Institute for Healthy Living and Chronic Disease Prevention* (BC Interior Health Authority / University of British Columbia). Research Interest Group Grant "Medical Cannabis and Arthritis - Barriers and Pathways" $10,000. Co-Investigators: Kam Shojania, M.D., Susan Holtzman, Ph.D., Cheryl Koehn.

2013 - **Supervisor** - *Social Sciences and Humanities Research Council.* Joseph-Armand Bombardier Master's Scholarship "Examining Linguistic Cues Regarding Intimate Relationships in Psychopathic Versus Non-Psychopathic Offenders"- $17,500. Co-Supervisor Steven Porter, Student awardee: Lacy Peters.

2012 - **Principal Investigator** - *Peter Wall Endowment*
Peter Wall Solutions Initiative "Medical Cannabis – Standards, Engagement, Evaluation & Dissemination (SEED)" - 3-years - $90,000. Co-Investigators: Rielle Capler, MA., Philippe Lucas, MA.

2011 - **Principal Investigator** - *Social Sciences and Humanities Research Council.* Standard Operating Grant "One Size Does Not Fit All: A Prospective Multimethod Examination of Subtypes of Women and Men Involved in Intimate Partner Violence" -3-years - $117,150.

Supervisor - *Social Sciences and Humanities Research Council.* Doctoral Fellowship Award "Social support needs of women involved in intimate partner violence. -3-years - $60,000. Student awardee: Jennifer I. Langille, MA

2010 - **Co-Principal Investigator** - *Canadian Foundation for Innovation.* Leaders Opportunity Fund "Centre for the Study of Psychology and Law" $413,285 Co-Principal Investigators: Stephen Porter, Ph.D. & Michael Woodworth, Ph.D.

Completed:

2011 - 2013 **Principal Investigator** - *Institute for Healthy Living and Chronic Disease Prevention (BC Interior Health Authority / University of British Columbia).* Research Interest Group Grant "Barriers to Accessing Medical Cannabis Among Individuals with Chronic Illness" $10,000. Co-Investigators: Michael Woodworth, Ph.D., Susan Holtzman, Ph.D., Robert Calloway, Jamie Marshall.

2012 - 2013 **Co-Investigator** - *Canadian Institutes of Health Research.* Planning grant "Cannabis for Therapeutic Purposes in Provincial Health Systems: A Priority Setting Workshop" $24,471. Principal investigator: Lynda G Balneaves, Ph.D.

2012 - 2012 **Principal Investigator** - *Health Canada.* Drugs and Tobacco Initiatives "Targeted Prevention for Cannabis Use Among Canadian Youth - Environmental Scan and Literature Review" $7,813

2010 - 2012 **Supervisor** - *Social Sciences and Humanities Research Council.* Joseph-Armand Bombardier Master's Scholarship "Subtypes of Male and Female Partner Violence Perpetrators"- $17,500. Student awardee: Alissa Fezatte

2010 - 2012 **Co-Investigator** - *Canadian Institutes of Health Research.* Catalyst grant "Alternative intervention for marijuana use (AIM): Addressing individual risk factors for transitions to initiation and escalation of marijuana use in early adolescence." $87,001. Principal investigator: Marvin Krank, Ph.D.

Co-Investigator - *Institute for Healthy Living and Chronic Disease Prevention (BC Interior Health Authority / University of British Columbia).* Research Interest Group Grant "Improving the Health and Well-Being of Men Who Have Sex With Men in the Interior of British Columbia" $10,000. Principal investigator: Susan Holtzman, Ph.D.

2008 - 2009 **Principal Investigator** - *Canadian Institutes of Health Research.* Fellowship Award in Clinical Research: "Personality disorder as a moderator of treatment outcome for male and female perpetrators of partner violence." $60,00/$120,000 (Declined 2010). Supervisors: Gregory L. Stuart, Ph.D. & M. Tracie Shea, Ph.D.

HONOURS & AWARDS

2014 Teaching Honour Roll Award, UBC

2013 Teaching Honour Roll Award, UBC

2008 Internship Research Grant, Brown University

2007 Student Travel Award, Rosalind Franklin University

2006 Dissertation Award, American Academy of Forensic Psychiatry

2006 Dissertation Award, American Psychological Association

2005 Grant-in-Aid for Student Research, American Psychology and Law Society

2004 Award for Research Excellence, Rosalind Franklin University

2001 - 2004 Academic Fellowship, Rosalind Franklin University

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Research paper

Cannabis for therapeutic purposes: Patient characteristics, access, and reasons for use

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[d] Centre for Addictions Research of British Columbia, PO Box 1700 STN CSC, Victoria, BC V8W 2Y2, Canada
[e] Canadian Association of Medical Cannabis Dispensaries, Box 14, Lions Bay, BC V0N 2E0, Canada
[f] Green Cannapy Research and Development, 288 Highway 33W, Kelowna, BC V1X 1X7, Canada

This is Exhibit "B" referred to in the affidavit of Zachary Walsh sworn before me at Kelowna, BC this 29th day of Oct 20 14

A commissioner for taking affidavits for British Columbia

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ABSTRACT

Background: The authorized and unauthorized use of cannabis for therapeutic purposes (CTP) has increased dramatically in recent years, and physicians have called for further research to better clarify the parameters of effective and appropriate use. We report findings from a large cross-sectional study of the use of CTP in Canada and compare use across medical conditions and across authorized and unauthorized users.

Methods: We examined cannabis use history, medical conditions and symptoms, patterns of current use of CTP, modes of access and perceived effectiveness among 628 self-selected Canadians consumers of CTP. Participants were recruited from medical cannabis dispensaries and from organizations that assist users of CTP.

Results: Patients reported using cannabis to treat multiple symptoms, with sleep, pain, and anxiety being the most common. Cannabis was perceived to provide effective symptoms relief across medical conditions. Patterns of use were also consistent across medical conditions. Notable differences were observed with regard to modes of access.

Conclusion: Across medical conditions respondents reported using cannabis to effectively address diverse symptoms. Results indicate a substantial disconnect between the therapeutic use of cannabis and research on the risks and benefits of such use; particularly with regard to the anxiolytic and sedative use of cannabis. Authorized and unauthorized users exhibited few meaningful differences with regard to medical conditions and patterns of use, but faced substantial differences regarding access.

Cannabis has a long history of medical use (Abel, 1980; Earleywine, 2005; Iverson, 2008), and after decades of marginalization the therapeutic properties of cannabis and cannabis derivatives are receiving increased attention (Earleywine, 2005; Holland, 2010; Lucas, 2008). Indeed, robust and growing evidence indicates that cannabis has medical benefits for diverse conditions and an acceptable risk profile (Joy, Watson, & Benson, 2003). In response to legal recognition of the constitutional rights of Canadians to access cannabis for therapeutic purposes (CTP), the federal government enacted the *Marihuana Medical Access Regulations* and initiated a centralized program in 2001, and in 2003 Health Canada began to provide CTP to patients. This program authorizes two categories of individuals to possess cannabis for medical purposes; Category 1 includes symptoms associated with HIV/AIDS, arthritis, spinal cord injury or disease, cancer, epilepsy, or MS, whereas Category 2 includes other symptoms and conditions assessed by a physician and a specialist. Those authorized can purchase dried cannabis from Health Canada, can purchase seeds to grow cannabis, or designate a person to grow cannabis on their behalf. In addition, medical cannabis dispensaries that operate under an ambiguous legal status provide CTP and related services to over 50,000 patients across Canada (Lucas, 2008).

Despite widespread concern with the efficiency of the Health Canada program (Holland, 2010), registration has grown exponentially from under 500 registrants in 2002 to over 26,000 in 2012 (Health Canada, 2012a). National surveys indicate substantial access outside of the Health Canada program; recent estimates

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suggest that 400,000 to 1,000,000 Canadians use CTP (Health Canada, 2011). Diverse reasons for use and multiple modes of access complicate the characterization of use of CTP, and health care professionals have expressed concern regarding the dearth of information on CTP; a recent Canadian Medical Association-sponsored survey reported that over 80% of physicians wanted more information on therapeutic indications, clinical guidelines, and risks and benefits of CTP (CMA, 2012).

Several studies have examined CTP use among Canadians. A regional survey reported that approximately 2% of adults used CTP in the past year, primarily to relieve nausea and pain (Braitstein et al., 2001), and a more recent national survey estimated that one million Canadians, or 4% of those aged 15 and older, used cannabis to treat self-defined medical conditions in the previous 12 months (Adlaf, Begin, & Sawka, 2005). Studies of persons living with HIV/AIDS report rates of 15–30% use of CTP, primarily for treatment of nausea, pain, and mood-related symptoms (Belle-Isle & Hathaway, 2007; Ware, Rueda, Singer, & Kilby, 2003). Studies of patients with MS and patients with chronic pain report similar results; approximately 15% of respondents report use of CTP with high levels of perceived effectiveness for diverse symptoms including nausea, pain, and mood (Belle-Isle & Hathaway, 2007; Ware et al., 2003; Clark, Ware, Yazer, Murray, & Lynch, 2004). Studies of CTP from the US, Europe, and Australia report findings that are consistent with those of Canadian studies; CTP is perceived to be an effective treatment for symptoms including pain, nausea, and negative mood (Grotenherman & Schnelle, 2003; Harris et al., 2000; Lucas, 2012; Reiman, 2007; Reinarman, Nunberg, Lanthier, & Heddleston, 2011; Swift, Gates, & Dillon, 2005; Ware, Adams, & Guy, 2005).

In sum, patient-centered research provides evidence for the acceptability and perceived effectiveness of CTP. However, substantial knowledge gaps remain and health care professionals have explicitly called for further research to better specify the parameters for appropriate use of CTP (CMA, 2012). Indeed, to date no studies have directly compared use of CTP across medical conditions or across modes of access (i.e., authorized vs. unauthorized). In the present study we report demographic characteristics, medical conditions and symptoms, reasons for use, perceived effects, and authorized and unauthorized modes of accessing CTP among Canadians. Comparing users of CTP across symptoms and across medical conditions with regard to patterns of use, and perceived effectiveness may help direct future controlled studies of the efficacy of CTP for specific conditions, and inform the development of tailored CTP regimens. In addition, comparing authorized and unauthorized CTP users may elucidate factors that underlie patient adoption of the Canadian CTP program, and help to guide the refinement of the complex process of CTP distribution and monitoring.

Method

Design

We obtained cross-sectional data in 2011–2012 from 628 self-selected current CTP users. Participants were recruited from two contexts; *national* participants completed the survey online from the location of their choice, and *local* participants completed the survey at a cannabis dispensary in the Interior region of British Columbia (BC). This recruitment strategy was designed to allow for comparison of the relatively less controlled online *national* condition with the confirmed CTP users queried in-person in the *local* condition. A total of 702 *national* participants completed the consent form, of whom 541(77%) reported current CTP use. All 87 *local* participants who completed the consent form reported current CTP use. The *national* survey was promoted via organizations and media that serve users of CTP patients (e.g., Canadian AIDS Society, Canadian Aboriginal AIDS Network, Cannabis Culture), and by national advertisements at MC dispensaries. To preserve confidentiality, no identifying data (i.e. IP addresses) were collected for *national* participants. The *local* group was comprised of dispensary members who were either authorized to possess cannabis through Health Canada or had documented confirmation of a medical condition for which CTP is indicated. No confirmation of medical condition was provided for *national* participants; however such confirmation is required to obtain Health Canada authorization and to obtain dispensary membership. Participants in the *local* group were compensated $10 and were aided by research assistants; participants in the *national* group were not assisted or financially compensated.

The survey was designed to be completed in less than one hour, and consisted of a total of 414 adaptive questions administered online without forced response. The survey was organized hierarchically such that many items were contingent on prior responses; as a result, respondents were presented with diverse item sets and response rates for specific items, and total response times varied accordingly. The survey was developed based on previous research, and on consultations with a community research board comprised of CTP patients and experts, and includes questions drawn from a prior study of CTP use (Belle-Isle & Hathaway, 2007). It queried access, perceived effectiveness, patterns and history of cannabis use, medical diagnoses and symptoms, mood, and demographics (a copy of the survey is available upon request from the first author). The study was approved by the Behavioural Research Ethics Board of the Okanagan campus of the University of British Columbia. All categorical data were compared using X^2. In light of varying response rates across items, total number of responses is reported for each analysis. Due to the large number of comparisons all significance testing was conducted at the $p < .01$ level to minimize the likelihood of interpreting chance results while maintaining power (Nakagawa, 2004).

Table 1
Demographics.

	CTP patients, % (*n*)	Census, %	*Z*
Male	71(443)	49	11.03[a]
Ethnicity			
White	92 (581)	80	7.52[a]
Aboriginal	7 (47)	4	3.80[a]
Age			
18–24yrs old	17 (99)	12	3.86[a]
25–34	26 (158)	16	6.84[a]
35–44	19 (115)	20	.63
45–54	24 (141)	20	2.51
55>	14 (85)	32	9.67[a]
Education			
<high School	4 (27)	15	−7.86[a]
HS Grad	37(234)	24	7.63[a]
% post secondary	58 (367)	61	−1.54
Income			
<$20,000	33 (206)	44	−5.55[a]
$20,000–39,999	26 (165)	27	−.56
$40, 000–59,999	17 (103)	15	1.43
$60,00 +	24 (146)	14	7.22[a]
Residence			
Rural	22 (137)	20	1.25
Urban	78 (485)	80	−1.25

Note: Z = One sample *Z-test* for proportions, comparing medical cannabis users to values from the 2006 Canadian Census (Statistics Canada, 2006).

[a] $p < .01$.

Results

Preliminary analyses

We compared the responses of *local* participants who reported residency in the province of BC and accessing CTP via

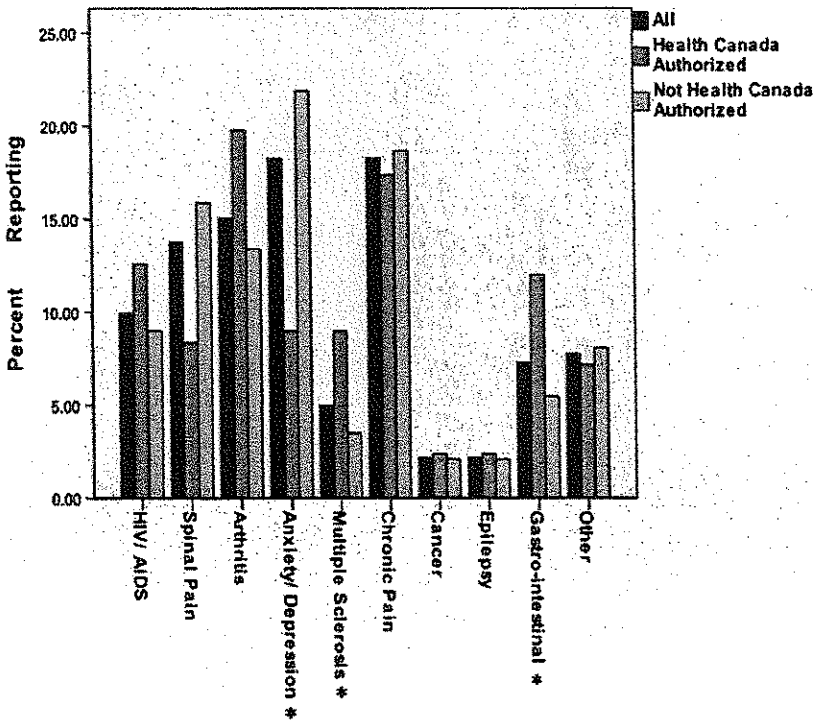

Fig. 1. Primary medical conditions treated with cannabis by authorization. *Note:* Sleep Disorders, Attention Deficit Disorder, Fibromyalgia, Hepatitis C, Parkinson's Disease, Wilson's Disease, Scleroderma, Tourette's Syndrome, and unspecified Psychotic Disorder Conditions each comprised less than 2% of the sample and were aggregated into the category 'Other'. The anxiety and mood disorders category included 35 participants who reported a primary *illness/condition* of anxiety, 34 who reported depression and 40 who reported both anxiety and depression. Comparisons of these groups indicated equivalent profiles with regard to demographic characteristics, health, and use of CTP, and were therefore aggregated for statistical analyses; $n = 502$ * = difference between proportion Health Canada Authorized and Unauthorized $p < 01$.

dispensary ($n = 63$) to *national* participants who reported BC residency and accessing CTP via dispensary ($n = 53$). Analysis indicated no differences with regard to quantity or frequency of cannabis use, and indicated substantial similarity with regard to primary medical condition; the only difference was a smaller proportion of *local* respondents reporting gastrointestinal (GI) condition as primary ($X^2 = 8.94\,(1)$, $p < .01$). This broad similarity between in-person confirmed users of CTP (i.e. *local*) and online respondents increased our confidence in the validity of online responses.

Demographics

Comparisons of the sample to values drawn from the Canadian 2006 Census of Population (Statistics Canada, 2006; Table 1) indicated that male, White, and Aboriginal participants were overrepresented. The users of CTP were also younger, had a higher income, and were more likely to have completed high school. The regional distribution was consistent with participation in the Health Canada program (Health Canada, 2012b).

Medical conditions and symptoms

Participants were queried regarding a single primary *condition* treated with cannabis (Fig. 1). Participants also checked all applicable *symptoms* (Table 2) they treated with cannabis from a list. The mean number of symptoms patients endorsed treating was 6.74 ($n = 605$, SD = 3.00, Median = 6.00, Interquartile range = 4.00–8.00). Symptoms reportedly treated with CTP by fewer than 10% of the sample include high blood pressure (9%), tics (8%), regulating blood sugar (7%), seizures (6.%), bladder dyscontrol (6%) and impotence (6%). Aggregate examination across *condition* indicated that pain, anxiety, and sleep problems were the most frequently endorsed symptoms; 57% reported use to address all three symptoms, and 99% endorsed treating one or more of the three.

Symptoms treated with cannabis varied across *condition* (Table 2). Use to address pain symptoms was more prevalent among individuals whose primary conditions were pain-related (i.e., chronic spinal and non-spinal pain, arthritis). Chronic spinal pain participants were more likely to report treating muscle spasms. Participants with arthritis were more likely to report use for inflammation and ocular pressure, and less likely to report use to address anxiety and appetite. Participants who identified mood and anxiety disorders as their primary condition were more likely to use cannabis to address mental health-related symptoms (i.e., anxiety, depression, aggression, mania/psychosis), and were less likely to treat pain, inflammation, and muscle spasms. Participants who identified HIV/AIDS or GI as their primary conditions were more likely to treat symptoms of nausea and appetite, and HIV/AIDS was associated with less treatment of pain and aggression. Overall, cannabis was perceived to provide effective symptoms relief; 72% ($n = 439$) reported that CTP was *always* helpful and an additional 24% ($n = 147$) described it as *often* helpful. The proportion of participants who described CTP as *always* helpful was relatively consistent across conditions. The only difference across groups was relatively lower endorsement of *always* helpful (55%) by participants with HIV/AIDS ($X^2 = 10.04\,(1)$, $n = 593$, $p < .01$). Over half (57%, $n = 358$) of participants reported using other medications to address the symptoms they were treating with CTP. Of these, 79% ($n = 281$) described CTP as having fewer side effects than the concurrent treatment.

Use patterns

History of non-therapeutic cannabis use prior to therapeutic use was reported by 82% ($n = 441$) of participants.

Table 2
Symptoms addressed with medical cannabis by condition.

	All		Pain-spinal			Pain–nonspinal			Arthritis			Mood			HIV/AIDS			GI		
	n	%	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2
Sleep	502	85	68	83	0.35	93	85	<.01	80	90	1.91	99	93	5.7	47	78	2.4	33	77	2.54
Pain	486	82	80	98	15.13[a]	102	94	11.56[a]	86	97	14.67[a]	56	52	81.21[a]	41	68	9.07[a]	40	93	3.62
Anxiety	463	79	65	79	0.04	85	78	0.02	57	64	12.92[a]	106	99	32.81[a]	44	73	1.05	29	67	3.34
Depression	394	67	55	67	<.01	68	62	1.16	51	57	4.24	98	92	36.26[a]	34	57	3.08	27	63	0.33
Appetite/weight	331	56	43	52	0.52	56	51	1.21	35	39	11.98[a]	61	57	0.04	46	77	11.47[a]	33	77	8.02[a]
Nausea	294	49	36	44	1.34	56	51	0.13	33	37	6.82[a]	43	40	4.86	47	78	21.71[a]	35	81	18.48[a]
Inflammation	291	49	51	62	6.31	52	48	0.14	79	89	65.23[a]	25	23	35.23[a]	20	33	6.83[a]	25	58	1.44
Spasms	280	48	58	71	20.69[a]	53	49	0.07	50	56	3.2	23	22	35.33[a]	20	33	5.34	22	51	0.255
Headache	237	40	44	54	7.21	56	51	6.99[a]	36	40	<.01	38	36	1.18	15	25	6.4	12	28	2.9
Aggression	140	24	19	23	0.01	28	26	0.28	16	18	1.92	42	39	17.40[a]	5	8	8.75[a]	8	19	0.67
Drug Withdrawal	76	13	10	12	0.04	17	16	0.88	10	11	0.25	18	17	1.81	8	13	0.01	1	2	4.61
Ocular Pressure	68	12	11	13	0.33	11	10	0.27	19	21	9.92[a]	8	8	2.1	7	12	<.01	1	2	3.85
Mania/Psychosis	67	11	9	11	0.01	11	10	0.21	7	8	1.27	25	23	18.72[a]	4	7	1.46	5	12	<.01
Respiratory	67	11	5	6	2.62	20	18	6.5	14	16	1.99	12	11	<.01	3	5	2.68	6	14	0.31
Skin Conditions	63	11	8	10	0.08	7	6	2.54	13	15	1.7	16	15	2.51	3	5	2.26	5	12	0.04

Note: X^2 = Comparison of each groups versus aggregation of other groups.
[a] $p < .01$.

Mean age was 17.30 years ($n = 540$, SD = 7.08, Median = 16, Interquartile range = 14.00–18.00) for first use and 28.35 years ($n = 538$, SD = 11.25, Median = 25, Interquartile range = 19.00–37.00) for first therapeutic use. Individuals with and without history of non-therapeutic use did not differ with regard to demographic characteristics, or conditions and symptoms. Most participants who reported prior use reported increased use with the initiation of therapeutic use; 33% reported a large increase and 32% a small increase, whereas 7% reported a large decrease and 10% a small decrease. Aggregate analyses indicated that 40% ($n = 167$) of users fell into the modal quantity of use category of *more than 14 grams per week*, and that 42% ($n = 226$) fell in the modal frequency of use group reporting *2–3 uses per day*. Among the group that used more that 14 grams per week, the median weekly amount used was 28 grams (Interquartile range = 21–45). Comparisons of the six medical conditions that each account for 5% or more of the sample (Table 3) indicated no difference with regard to modes of use and few differences in patterns of use; a larger proportion of individuals identifying HIV/AIDS as primary condition were among the groups with lowest quantity and frequency of use, and those who identified anxiety and/or depression as primary conditions were less likely to fall in the most frequent use group. Overall health quality was also associated with frequency of use such that participants who described their overall health as *fair* or *poor* (34%, $n = 161$) were overrepresented in the most frequent use group ($X^2 = 8.31$ (1), $n = 473$, $p < .01$).

Access

Aggregate examination indicated that 32% ($n = 167$) of respondents had Health Canada authorization to possess CTP. An additional 12% ($n = 64$) had applications in process, and 3% ($n = 13$) had applied and been rejected. The proportion of authorized individuals varied across condition (Fig. 1); individuals who identified anxiety and/or depression as primary condition were less likely to be authorized ($X^2 = 13.13$ (1), $n = 502$, $p < .01$), whereas a greater proportion of MS ($X^2 = 11.08$ (1), $n = 502$, $p < .01$) and GI ($X^2 = 8.68$ (1), $n = 502$, $p < .01$.) participants were authorized. Most participants reported using more than one mode of accessing CTP; the mean number of access modalities was 1.89 ($n = 500$, SD = .88, Median = 2.00, Interquartile range = 1.00–2.00). Authorization was a determinant of access (Fig. 2): the mean number of access modalities for authorized individuals was 2.11 ($n = 162$, SD = .98, Median = 2.00, Interquartile range = 1.00–3.00) compared to 1.78 ($n = 337$, SD = .81, Median = 2.00, Interquartile range = 1.00–2.00) for unauthorized users (F (1, 497) = 16.26, $p < .01$). Authorized users were more likely to access CTP via Health Canada ($X^2 = 11.88$ (1), $n = 443$, $p < .01$), to grow for themselves ($X^2 = 31.42$ (1), $n = 493$,

Table 3
Characteristics of cannabis use by condition.

	All		Pain-spinal			Pain-nonspinal			Arthritis			Mood			HIV/AIDS			GI		
	n	%	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2	*n*	%	X^2
Amount per week (Grams)																				
≤2	42	9	5	8	0.1	9	10	0.13	3	4	2.59	9	10	0.3	11	27	18.01[a]	1	3	1.68
2.1–5	60	13	8	13	<.01	11	12	0.05	10	13	0.04	11	13	<.01	5	12	<.01	0	0	5.46
5.1–9	85	18	7	11	2.44	22	24	2.81	11	15	0.63	24	28	6.81[a]	6	15	0.33	6	17	0.02
9.1–14	76	16	15	24	3.04	15	16	<.01	15	20	1.06	11	13	0.89	4	10	1.3	6	17	0.04
>14	212	45	29	45	0.01	35	38	2	46	48	0.41	32	37	2.66	15	37	1.18	22	63	5.08
Frequency of use																				
< daily	58	11	6	9	0.4	13	13	0.31	3	4	4.72	13	14	1.06	13	25	10.85[a]	2	5	1.4
1x day	71	14	7	10	0.71	16	16	0.43	12	16	0.32	17	19	2.31	8	15	0.12	1	3	4.17
2-3x	174	33	21	31	0.19	31	30	0.56	26	34	0.01	36	39	1.77	16	30	0.24	14	37	0.24
4x+	221	42	34	50	1.96	43	42	0.01	36	47	0.78	26	28	8.86[a]	16	30	3.48	21	55	2.88
Preferred mode of use																				
Smoke ($n = 513$)	293	57	35	54	0.33	62	61	0.94	41	53	0.55	48	53	0.86	35	67	2.45	24	65	0.98
Vaporize ($n = 502$)	217	43	31	49	1.05	42	43	<.01	30	39	0.67	37	41	0.3	22	44	0.01	16	43	<.01
Oral ($n = 501$)	139	28	16	26	0.13	29	30	0.21	29	39	5.25	25	26	0.1	15	31	0.22	8	22	0.75

Note: X^2 = Comparison of each groups versus aggregation of other groups.
[a] $p < .01$.

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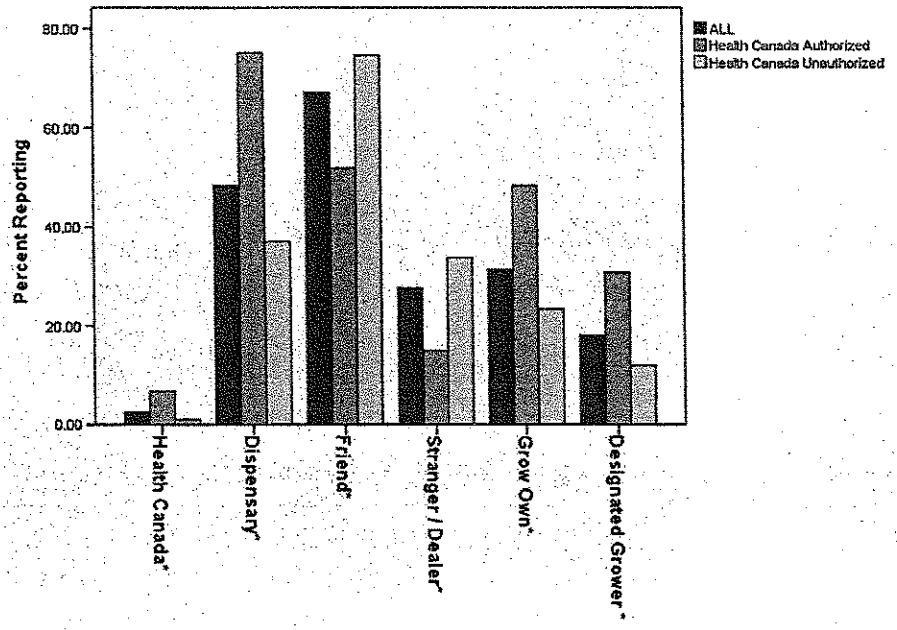

Fig. 2. Modes of Access. *Note:*. * = difference between proportion Health Canada Authorized and Unauthorized $p < 01$; $n = 498$.

$p < .01$), have a designate grow for them ($X^2 = 25.85$ (1), $n = 493$, $p < .01$) or use a dispensary ($X^2 = 54.46$ (1), $n = 444$, $p < .01$). In contrast, unauthorized users were more likely to access CTP from a friend ($X^2 = 25.46$ (1), $n = 495$, $p < .01$) or from a stranger ($X^2 = 18.69$ (1), $n = 494$, $p < .01$).

Discussion

Canadians use cannabis to treat diverse conditions and symptoms in a manner that only partially overlaps with the federally authorized program. There is considerable consistency with regard to patterns of use and reported effectiveness; nearly all respondents used cannabis to treat pain, anxiety, or sleep disturbances, and over half used it to treat all three symptoms. We also observed consistency across participants with and without histories of non-therapeutic cannabis use, which suggests that, with regard to CTP, individuals who may enjoy non-therapeutic use of cannabis were not different with regard to therapeutic application of cannabis from those participants who may have been less likely to expect extra-therapeutic benefit. The substantial minority of respondents who were federally authorized to possess cannabis exhibited few differences from unauthorized users with regard to symptoms treated and patterns of use, but differed considerably with regard to mode of access.

Most respondents reported using CTP to treat conditions that are explicitly listed within the federal program; however, a large contingent also reported use for other conditions. Comparisons of symptoms treated across conditions indicated high levels of congruence (e.g., respondents with pain-related conditions were more likely to use cannabis to address pain symptoms), but also reflected substantial consistency across conditions. Specifically, use to treat sleep disturbances, and to a lesser extent anxiety and depression, was consistently high across conditions. However, despite widespread use for anxiolytic and sedative purposes, participants who reported anxiety or depression as primary reason for CTP use were less likely to have obtained federal authorization to access CTP. This may be due to the absence of these conditions among those explicitly listed by the federal program, but may also reflect accentuated stigma associated with the use of cannabis to address mental health issues. Indeed, stigma has been identified as a substantial barrier to accessing care for mental health conditions such as depression and anxiety (Brown et al., 2010), and this may be compounded by the considerable stigma associated with use of CTP (Bottorf et al., 2013) to create a substantial barrier to accessing treatment. Research that further elucidates the appropriateness of using cannabis to treat anxiety and depression is required to guide effective treatment and help to reduce stigma.

Patterns of use were also consistent across medical conditions, with the only notable difference being slightly lower levels of use among respondents with HIV/AIDS, a difference which may be due to intermittent use to address nausea. Most participants reported initiating non-therapeutic use prior to use of CTP, and noted increased levels of use associated with the transition to therapeutic use. This reported increase is consistent with our observation that the median level of therapeutic use exceeds typical levels of non-therapeutic use (Reinarman, Cohen, & Kaal, 2004; Hazekamp et al., 2013; but see also Hazekamp & Heerdink, 2013), and suggests a potentially meaningful distinction between therapeutic and non-therapeutic use. In contrast, the relative consistency of use among CTP-users suggests that CTP regimens might transfer well across conditions, and enjoy good adherence. The most pronounced differences across respondents involved modes of access, such that unauthorized users were much less likely to access CTP from authorized, or semi-authorized (i.e. dispensaries) sources. This discrepancy contrasts with the pronounced similarity between authorized and unauthorized users on indicators of health and use of CTP, and suggests that the current system of authorization may not be discriminating among qualitatively different groups.

The primary limitations of this study are common to online medical surveys such as potential for multiple responses from a single respondent, a potentially unrepresentative sample, and lack of physician confirmation of medical conditions. In addition, response bias related to participant self-selection, and recruitment through organizations that support medical cannabis patients likely resulted in overrepresentation in our sample by individuals who respond favourably to CTP. In light of this potential bias, our characterization of the therapeutic use of cannabis should be interpreted with caution pending replication from research that employs a more systematic recruitment approach. However, these limitations are counterbalanced by several methodological

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strengths including the inclusion of an in-person subsample, engagement of a community research board in the development and dissemination of the survey, and general adherence to established standards for reporting internet-based surveys (Eysenbach, 2004).

Conclusions

This was the largest and most comprehensive study to date of the therapeutic use of cannabis in Canada. We draw three primary conclusions from the data. First, reasons for use and perceived effectiveness were generally consistent across medical conditions; respondents overwhelmingly reported using cannabis to effectively address pain, sleep disturbance, and anxiety. Second, further research is required to address the substantial disconnect between the therapeutic use of cannabis and research on the risks and benefits of such use. This is particularly evident with regard to the anxiolytic and sedative use of cannabis; extrapolation from our sample to the national population of CTP users suggests levels of use for anxiolytic and sedative purposes that may be comparable to the number of Canadians who currently use benzodiazepine and other sedatives (Kassam & Patten, 2006). Such widespread use suggests a need for the systematic evaluation of the effectiveness and adverse effects of cannabis for the treatment of these conditions, as well as comparisons of cannabis with the widely-used pharmaceutical products that currently represent frontline treatments. Finally, our findings highlight the apparent discrepancy in access to cannabis across CTP users. Authorized and unauthorized users exhibit few meaningful differences with regard to medical conditions and patterns of use, but face substantial differences regarding access; many seriously ill Canadians risk increased stigma (Bottorf, Bissell, Balneaves, Oliffe, Capler & Buxton, 2013), legal sanction, and other negative outcomes associated with accessing cannabis from illegal markets. At the time of this writing the federal medical cannabis program is undergoing substantial structural changes. The present study provides a baseline for assessing the impact of these changes, the most important of which must surely involve providing a program that facilitates informed, safe, legal, and affordable access to a source of CTP for ill Canadians.

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Conflict of interest statement

None of the authors have any conflicts of interest with regard to the contents of this manuscript. Access.

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ACADEMIC APPOINTMENTS

2014 -	Associate Professor, University of British Columbia, Kelowna, BC.
2009 -2014	Assistant Professor, University of British Columbia, Kelowna, BC.
2008	Adjunct Professor, Rhode Island College, Providence, RI.
2006	Graduate Teaching Assistant, Rosalind Franklin University, North Chicago, IL.
2004 - 2005	Group Dynamics Consultant and Trainer - Tavistock Study Group, Northwestern University, Evanston, IL.

Courses taught - *Drugs and Behaviour*
Introduction to Psychology - Basic Processes
Research Methods and Statistics
Psychological Interventions I
Psychopathology II

CLINICAL APPOINTMENTS

2014 -	Clinical supervisor - Residential addictions treatment - The Bridge, Kelowna, BC.
2014 -	Facilitator - Men's relationship group - Kelowna Family Centre, Kelowna, BC.
2013 -	Independent rater - Phase 3 Clinical Trial - MDMA for PTSD - Multidisciplinary Association for Psychedelic Studies, Vancouver, BC.
2008 - 2009	Research therapist - Brief Motivational Intervention for addictions and family violence, Butler Hospital, Providence, RI.
2008 - 2009	Research therapist - Cognitive Behavioral Therapy for anger and trauma, Providence Veterans Affairs Hospital, Providence, RI.
2007 - 2008	Graduate therapy intern - Cognitive Behavioral Therapy and Motivational Enhancement Therapy for addictions, Butler Hospital, Providence, RI.
2007 - 2008	Graduate therapy intern - Dialectical Behavior Therapy for women with emotion regulation difficulties, Butler Hospital, Providence, RI.
2006 - 2007	Graduate therapy extern - Cognitive Behavioural Therapy for anxiety disorders, Clinics at Rosalind Franklin University, North Chicago, IL.
2005 - 2006	Graduate psychometrics extern - Forensic neuropsychological assessment, Isaac Ray Center, Chicago, IL.
2004 - 2005	Graduate therapy extern - Cognitive Behavioral Therapy and Motivational Enhancement for addictions, University of Chicago Hospital, Chicago, IL.
2004 - 2005	Graduate therapy extern - Dialectical Behavior Therapy for women with emotion regulation difficulties, University of Chicago Hospital, Chicago, IL / Emotion Management Program, Tinley Park, IL.
2003 - 2004	Graduate psychometrics extern - Neuropsychology, University of Chicago Hospital, Chicago, IL.

OTHER APPOINTMENTS

2014 -	Member - Consultation Network of the Advisory Scientific Committee, Uruguayan National Drug Board, Montevideo, Uruguay
2014	Reviewer - UK Medical Research Council, Population Health Scientists Strategic Skill Fellowship Grant Program, Wiltshire, United Kingdom
2014 -	Topic expert - Online accredited continued medical education program on medical cannabis - mdBriefCase, Toronto, ON.
2014 -	Topic expert – "Med School for You" Online patient education program on medical cannabis - mdBriefCase, Toronto, ON.
2014 -	Vice President - Board of Directors, John Howard Society of the Central and South Okanagan
2013 -	Research Mentor - Intersections of Mental Health Perspective in Addictions Research Training (IMPART)
2013	Reviewer - German-Israeli Foundation for Scientific Research and Development, Young Scientist's Program Grant
2012	Reviewer - Social Sciences and Humanities Research Council of Canada (SSHRC), Insight Grant Program
2012 -	Member - Editorial Board, Legal and Criminological Psychology
2012 -	Member - Advisory Board, Multidisciplinary Association for Psychedelic Studies (MAPS) Canada
2011 -	Research Affiliate - Centre for Addictions Research of BC (CARBC)
2011 -	Director - UBC Centre for the Advancement of Psychological Science and Law
2010 - 2014	Member - Board of Directors, John Howard Society of the Central and South Okanagan
2008 - 2010	Psychiatry Faculty - Personality and Impulse Disorders Section, Faculty of 1000 Medicine
2008 - 2009	Project Manager - National Institute on Alcohol Abuse and Alcoholism - R01: *Brief intervention to reduce drinking among batterers,* PI: Gregory L. Stuart, Butler Hospital, Providence, RI.
2008 - 2009	Project Manager - National Institute on Alcohol Abuse and Alcoholism - R01: *Brief alcohol intervention for violent women,* PI: Gregory L. Stuart, Butler Hospital, Providence, RI.
2007 - 2008	Graduate Research Intern - National Institute of Mental Health - R01: *Collaborative longitudinal study of personality disorders,* site PI: M. Tracie Shea, Brown University, Providence, RI.
1997 - 2001	High School Teacher - Manitoba School Divisions 1 & 6, Winnipeg, MB.

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Addictive Behaviors
Biological Psychology
Criminal Justice and Behavior
Current Drug Abuse Reviews
International Journal of Law and Psychiatry
Journal of Abnormal Child Psychology
Journal of Interpersonal Violence
Personality and Mental Health
Psychology of Addictive Behavior
Psychological Assessment
Social Science and Medicine
Suicide and Life Threatening Behavior
Violence Against Women
Behavioral Sciences and Law
Substance Abuse Treatment, Prevention and Policy

MEMBERSHIPS IN SOCIETIES & ORGANIZATIONS

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Canadian Psychological Association
International Cannabinoid Research Society
Society for the Scientific Study of Psychopathy

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Research paper

Barriers to access for Canadians who use cannabis for therapeutic purposes

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This is Exhibit "C" referred to in the affidavit of Zachary Walsh sworn before me at Kelowna, BC this 29th day of Oct 2014

A commissioner for taking affidavits for British Columbia

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ABSTRACT

Background: There is increased interest in the therapeutic potential of cannabis in recent decades. Canada, the Netherlands, Israel and some states in the United States have developed programs to allow access to cannabis for therapeutic purposes (CTP). In Canada, enrollment in the federal CTP program represents fewer than 5% of the estimated users of CTP. The discrepancy between the number of Canadians who report using CTP and the rate of utilization of the federal CTP program suggests the existence of barriers to access to this program.
Methods: In the present study we employ a health services analytical framework to examine barriers to access to CTP among 628 current CTP users. We define barriers to access as areas of poor fit between clients and services. We use five dimensions of *accommodation*, *accessibility*, *availability*, *affordability*, and *acceptability* to examine access to CTP.
Results: Our findings reveal that it is difficult for Canadians to find a physician to support their application to access CTP. Accessing CTP from unauthorized sources was common; only 7% of respondents accessed CTP exclusively from authorized sources. Access to CTP was positively associated with the presence of medical cannabis dispensaries, which were not included in the regulatory regime. Access to CTP varied by medical condition and general quality of health. Affordability of CTP was a substantial barrier to access.
Conclusions: Strategies need to be developed to encourage scientific inquiry into CTP and address the barriers to access to CTP and the stigma and controversy that surround CTP and strain patient–physician relationships.

Background

After a period of marginalization, recent decades have witnessed increased interest in the therapeutic potential of cannabis (Holland, 2010). Canada, the Netherlands, Israel and some states in the United States have developed programs to allow access to cannabis for therapeutic purposes (CTP) (Shelef, Mashiah, Schumacher, Shine, & Baruch, 2011). An estimated one million Canadians, or 4% of those aged 15 and older, reported using cannabis in the previous 12 months to treat self-defined medical conditions (Adlaf, Begin, & Sawka, 2005; Belle-Isle & Hathaway, 2007). Court cases in Canada have confirmed the constitutional right of Canadians to choose cannabis as medicine without fear of criminal sanction (e.g. *R. v. Parker*, *Wakeford v. Canada*, *Hitzig et al. v. Canada*, *R. v. Mernagh*, *R. v. Smith*), and in 2001, the *Marihuana Medical Access Regulations* (MMAR) established guidelines for Canadians to obtain legal authorization to possess CTP. As of December 2012, 28,115 Canadians had obtained an authorization under these regulations to possess CTP and obtain CTP from a legal source (Health Canada, 2013). Although uptake of the federal program has increased in recent years, this enrollment represents fewer than 5% of the estimated users of CTP in Canada. The discrepancy between the number of Canadians who report using CTP and the rate of utilization of the

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federal CTP program suggests the existence of barriers to access to this program.

To obtain authorization to legally possess CTP under the MMAR, Canadians are required to obtain the written support of a physician on an application form and then apply to a federal authority. Those authorized can purchase dried cannabis from Health Canada, produce their own cannabis, or designate a person to grow cannabis on their behalf. In 2014, the MMAR are scheduled to be replaced by the *Marihuana for Medical Purposes Regulations* (MMPR). Under the MMPR, Canadians who wish to use CTP will need to obtain a medical document directly from a physician or nurse practitioner, similar to a prescription, which they will then submit to a commercial licensed producer. No onsite dispensing is allowed. Orders are shipped to patients. Both personal and designated licences to produce cannabis obtained under the MMAR will be phased out. These imminent changes, coupled with growing international interest, make it timely to analyse barriers to access to CTP under the current regulatory regime and to examine how new programs might address or exacerbate existing barriers.

In addition to authorized sources of CTP, medical cannabis dispensaries, also known as compassion clubs, represent a parallel source of CTP, providing CTP and related services to over 40,000 patients in Canada (Canadian Association of Medical Cannabis Dispensaries, 2013). Medical cannabis dispensaries arose in Canada in 1997 in response to demand for a community-based, safe, and quality controlled source of CTP (Capler, 2010). These dispensaries predate, and are not officially recognized by, the MMAR and operate under a legally ambiguous status (Belle-Isle, 2006). Additionally, many Canadians access CTP through friends, illicit self-production, and the street market.

The present study draws on data from the largest survey of Canadians who use CTP to date, the Cannabis Access for Medical Purposes Survey (CAMPS). We employ a health services analytical framework, developed to define the concept of 'access' and its relationship to patient satisfaction (Penchansky & Thomas, 1981), to examine barriers to access to CTP under the current program.

A health services analytical framework to examine barriers to access

Penchansky and Thomas (1981) offered a framework to define 'access' and its relationship to patient satisfaction in the context of health services research. Others have adapted this framework to examine barriers to health care and health services (Jacobs, Ir, Bigdeli, Annear, & Van Damme, 2012; Peters et al., 2008). For the purposes of our study, and in keeping with Penchansky and Thomas (1981), we define barriers to access as areas of poor fit between clients and services and use five dimensions to examine access to CTP: *accommodation*, *accessibility*, *availability*, *affordability*, and *acceptability*. Our study uses these dimensions as a lens through which to consider both access to authorization to possess CTP, as well as access to a source of CTP.

Accommodation refers to the "relationship between the manner in which the supply resources are organized to accept clients. . .and clients' ability to accommodate to these factors and the clients' perception of their appropriateness" (Penchansky & Thomas, 1981, p. 128). We conceptualize accommodation as an overarching dimension that broadly taps the appropriateness of the current model of CTP access in Canada with regard to meeting patients' needs. *Accessibility* refers primarily to the geographic location of services in relation to the location of the people in need of those services (Penchansky & Thomas, 1981; Peters et al., 2008). With regard to CTP, we examine the influence of provincial region of residence and community type (i.e. rural, suburban, and urban) on access both to physicians to obtain support to possess CTP, and to a source of cannabis. *Availability* refers to the adequacy of available services according to the nature of patient needs (Penchansky & Thomas, 1981; Peters et al., 2008). In the CTP context, we examine how medical conditions and general quality of health impact availability of physicians to support applications, the responsiveness of the administrative process required to obtaining authorization to possess CTP, and the availability of sources of CTP. *Affordability* reflects the relationship between the costs of services and products and the patients' willingness and ability to pay for them (Penchansky & Thomas, 1981; Peters et al., 2008). We address this dimension by examining associations among income, costs associated with CTP, and ability to access CTP. *Acceptability* covers patients' attitudes regarding service providers and how they perceive their service providers' attitudes toward them (Penchansky & Thomas, 1981; Peters et al., 2008). To examine this dimension we review indices of patient–physician communication, stigma with regard to communication with physicians, and patients' attitudes to the federal program.

A few studies have touched on issues related to barriers to access to CTP in Canada. In 2005, the Canadian AIDS Society conducted a survey of people living with HIV/AIDS which revealed that the majority of those who used or wanted to use CTP had spoken to their physician about CTP, and that only a small minority reported lack of physician support to be a substantial barrier to access (Belle-Isle & Hathaway, 2007). That study also found that just over one third of respondents had applied to the federal medical cannabis program, with many respondents describing barriers including the onerous, complicated or intimidating requirements of the program, mistrust of government, concerns about the repercussions, negative impression of the program, and lack of awareness of the program. Further, 86% of respondents reported obtaining CTP from unauthorized sources, including friends, dispensaries, unauthorized self-cultivation, and street dealers, whereas 8% had a license to produce their own CTP, 4% had a licensed designated grower and fewer than 2% reporting purchasing CTP from Health Canada. A more recent survey that was limited to federally authorized users of CTP reported similarly low levels of obtaining CTP from Health Canada, and high levels via dispensaries and licenced self-cultivation; however, these respondents reported generally high levels of satisfaction with the federal program (Lucas, 2012a).

Studies of physicians' attitudes and practices have identified their substantial concerns with the current state of CTP use and regulation in Canada. Jones and Hathaway (2008) found that the majority among a sample of family physicians, medical residents and medical students felt that, with regard to CTP, they "did not have access to the quality of evidence to which they are accustomed and with which they felt comfortable" (p. 170). The investigators also found that physicians tended not to ask their patients about their cannabis use and patients tended not to tell. A recent survey conducted by the Canadian Medical Association (Canadian Medical Association, 2012) revealed similar results; the majority of physicians believe they lack sufficient information on risks, benefits, and appropriate use of CTP. The same survey reported that one third of physicians never support their patients' request for CTP, whereas more than half do so only occasionally or seldom.

In sum, findings regarding CTP use in Canada indicate relatively low uptake of the authorized program on the part of patients and substantial discomfort on the part of physicians, suggesting a generally poor degree of "fit" between client and service. The present study presents a theoretically informed examination of the extent and nature of barriers to accessing CTP as experienced by Canadians. In light of the internationally expanding role of cannabis within the medical pharmacopeia, the elucidation of these barriers has the potential to inform and refine the development of CTP

programs, and might more broadly contribute to the understanding of barriers to access for emerging and potentially stigmatized therapies.

Methods

The study was approved by the Behavioural Research Ethics Board of the University of British Columbia. The research team consisted of academic researchers, representatives from community-based organizations and non-governmental organizations, and people who use CTP. The research thus borrowed from a participatory approach. The survey collected cross-sectional data from 628 self-identified current users of CTP in 2011–2012, both online at the *national* level and at a *local* British Columbia medical cannabis dispensary. Organizations and media that serve people who use CTP as well as dispensaries assisted with promoting the *national* survey (e.g., Canadian AIDS Society, Canadian Aboriginal AIDS Network, social media). No identifying data (i.e. IP addresses) were collected, to ensure confidentiality. Participants in the *local* group received $10 compensation and participants in the *national* group were not financially compensated. Of the 702 *national* participants, 541 (77%) reported current CTP use. Participants in the *local* group were recruited via advertising posters and word of mouth at the medical cannabis dispensary where data were collected. All 87 *local* participants who completed the consent form reported current CTP use. The *local* group consisted of members of the dispensary who were either authorized to possess cannabis through Health Canada or had documented confirmation of a medical condition for which CTP is indicated. This recruitment design allowed a comparison of the online *national* condition with the confirmed CTP users' queried in-person in the *local* condition, and preliminary analyses indicated broad similarity between local and national respondents (see Walsh et al., 2013 for a detailed comparison of local and national groups). Participants in the *local* group completed the survey online on a tablet provided by an onsite researcher assistant and received help as needed from research assistants.

The questionnaire consisted of 414 questions designed to be completed in less than one hour. It queried demographics, detailed CTP use, communications with health care providers, access to and experiences with the federal medical cannabis program and a supply of CTP and general indicators of health and well-being. The questionnaire also included questions drawn from the Barriers Questionnaire (Ward et al., 1993) and from prior studies of CTP use (Belle-Isle & Hathaway, 2007; Lucas, 2012a). It was administered online, and organized in a hierarchical manner such that exposure to many items was contingent on prior responses. As a result, the number of recorded responses varies across items and no participants completed all items. All reported percentages are based on number of responses to given items rather than on the entire sample. In order to enhance clarity we accompany all reported percentages with number of responses.

Analyses were conducted in a manner that reflected the health services framework that guided this investigation. Specifically, to address *accommodation* we use descriptive statistics to broadly represent the extent to which patient needs for access were met by the program with a focus on general obstacles, physician access, the application process and source of CTP. To analyse *accessibility* we compare patients across regions and types of community. To analyse differences in *availability* we examine variability in access across medical conditions and global health status. To analyse the *affordability* of CTP, we compare access across income groups and examine the extent to which the impact of cost-related barriers varied according to global health status. Finally, to examine *acceptability* we describe patient perceptions of caregiver attitudes and communication. All comparisons involved discrete groups for both selection and outcome variables and were therefore conducted using χ^2 tests.

Table 1
Demographic information about study participants.

	n	%
Gender		
Male	443	70.8
Female	180	28.7
Transgender/other	3	0.5
Ethnic origin		
Caucasian	581	92.5
First Nation	31	4.9
Metis	16	2.5
Age distribution		
18–24	98	16.4
25–34	158	26.5
35–44	115	19.3
45–54	141	23.6
55 and over	85	14.2
Completed level of education		
Elementary school	27	4.3
Secondary school	234	37.3
Technical college	225	35.8
University – undergraduate	108	17.2
University – graduate	34	5.4
Yearly household income		
Under $20,000	206	33.2
$20,000–$39,999	165	26.6
$40,000–$59,999	103	16.6
$60,000 and over	146	23.6
Area of residence		
Urban	289	46.5
Suburban	196	31.5
Rural or remote	137	22.0
Provincial region		
British Columbia	221	35.4
Prairies[a]	88	14.1
Ontario	242	38.7
Quebec	30	4.8
Maritimes[b]	44	7.0
Health status		
Excellent	22	4.6
Very good	114	24.0
Good	177	37.3
Fair	107	22.5
Poor	55	11.6

[a] Prairies include Alberta, Saskatchewan, Manitoba and Northwest Territories.
[b] Maritimes include New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador.

Results

Demographics

The 628 respondents were 71% male, 29% female and 0.5% transgender and other genders, 92% Caucasians and 7% First Nations and Metis. Mean age was 39.10 years (SD = 13.12), median household income was $30,000–$39,999, 96% had completed secondary school and 58% had completed some post-secondary education. Responses were obtained from all ten Canadian provinces and one of the three territories, and respondents reported living in urban (47%), suburban (32%), and rural or remote areas (22%) (Table 1). Respondents reported using CTP for anxiety and depression, pain, arthritis, spinal pain, HIV/AIDS, multiple sclerosis, cancer, epilepsy and a variety of other illnesses. Medical use of cannabis was mainly reported for the treatment of pain, followed by nausea, mood, spasticity and other symptoms. A detailed description of the demographic and medical characteristics of this sample is available elsewhere (Walsh et al., 2013).

Table 2
Accommodation: Appropriateness of the current model to meeting patients' needs.

Obstacles
- 86% (n = 420) experienced obstacles in accessing CTP

Physicians
- 32% (n = 156) sought another physician in relation to use of CTP
  - 57% (n = 89) of whom changed physicians more than once
- 29% reported that physician recommended CTP but refused to endorse application for authorized access (n = 143)

Application for authorization
- 48% (n = 245) had applied for authorized access
  - 59% (n = 145) of whom found the process difficult or very difficult
  - 47% (n = 114) of whom reported being somewhat or completely unsatisfied with the program

Access to an authorized source of CTP[a]
- 31% (n = 139) accessed CTP from an authorized source
  - 76% (n = 106) of them also accessed CTP from unauthorized sources[b]
- 7% (n = 33) accessed CTP exclusively through authorized sources
- 31% (n = 155) reported self-producing CTP for personal use, of whom 50% (n = 77) were licensed
- 34% (n = 42) of self-producers reported that it was difficult or very difficult to learn to cultivate cannabis; 16% (n = 24) reported arrests; 12% (n = 19) reported break ins
- Reported reasons for not self-producing CTP (n = 339) included: lack of space (43%, n = 146), expense of set up (37% n = 124), and legal concerns (32%, n = 108).
- The most important reason for self-producing was quality (39%, n = 52), followed by price (36%, n = 47), avoiding the black market (29%, n = 40), selection of a specific strain of cannabis (24%, n = 33), and safety (12%, n = 15).
- Of those who reported that someone else produced CTP for them (18%, n = 90), 67% (n = 60) had designated producers who were licensed. 39% (n = 35) of respondents with designated producers reported difficulties in finding one.

[a] Under the MMAR, authorized sources were limited to licensed self-production, licensed designated producer or direct purchase from the federal program.
[b] Unauthorized sources include medical cannabis dispensaries, friends, street market, unlicensed self-production, and unlicensed designated producers.

Accommodation

Accommodation refers to the appropriateness of the MMAR model of CTP access (in effect at the time of this study) to meeting patients' needs. Table 2 summarizes the key findings related to accommodation. The majority of respondents experienced obstacles to accessing CTP. Respondents described obstacles as affecting their mood, enjoyment of life, sleep, general activity, normal work outside or inside the home, and relationships (Fig. 1). Most respondents (81.1%; n = 489) reported discussing the use of CTP with a physician, and almost one third of respondents (Table 2) reported that they had sought a new physician in relation to their use of CTP, with the majority of those changing physicians more than once. Respondents reported equivocation on the part of physicians with regard to recommending and authorizing use of CTP. Among respondents who discussed CTP with their physicians, more than a quarter of them reported that physicians recommended they access CTP but refused to endorse their application for authorized access.

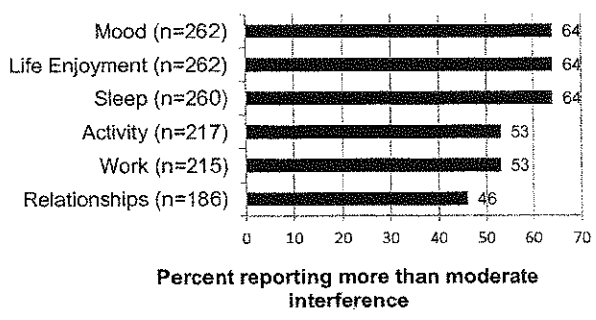

Fig. 1. Effects of barriers to access to cannabis for therapeutic purposes on life domains.

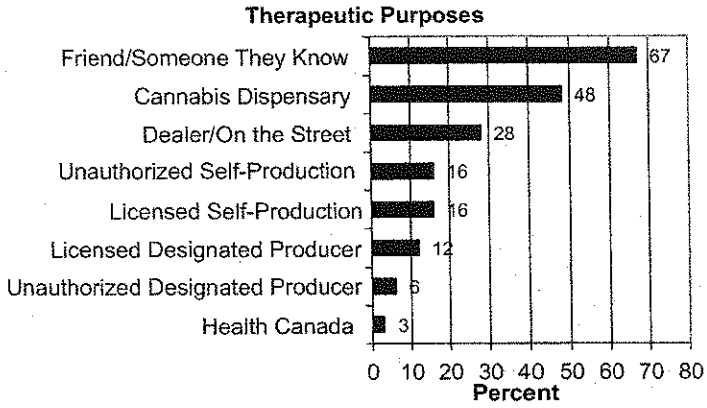

Fig. 2. Reported sources of cannabis for therapeutic purposes.

Nearly half of respondents had applied for a federal authorization to possess CTP, of whom 68% (n = 167) received authorization, 5% (n = 13) reported they did not, and 26% (n = 63) had applications that were under review at the time of the survey. Among applicants to the federal CTP program, more than half found the process difficult or very difficult, and almost half reported being somewhat or completely unsatisfied with the program.

Incongruent accommodation between patients and services is further evidenced in access to a source of CTP; the federal program makes available a single strain of dried cannabis, whereas 93% (n = 415) of respondents identified access to a specific preferred strain, a variety of strains, and/or alternative CTP products (e.g. baked goods, tinctures) as important options. Indeed, less than one third of respondents (Table 2) accessed CTP from authorized sources (i.e. licensed self-production, licensed designated producer, direct purchase from the federal program), and more than three quarters of respondents who had access to authorized sources also accessed CTP from unauthorized sources (i.e. dispensary, friend, street, unlicensed self-production, unlicensed designated producer). Overall, only 7% of respondents accessed CTP exclusively through authorized sources. Fig. 2 provides a detailed breakdown of sources of CTP.

Almost one third of respondents reported self-producing CTP, of whom half were licensed to produce CTP for personal use (Table 2). Approximately one third of self-producers reported that it was difficult or very difficult to learn to cultivate cannabis. Other reported difficulties associated with self-production included arrest and break-ins. Among respondents who provided reasons for not self-producing CTP, the most prominent reasons were lack of space, expense of set up, and legal concerns. The most important reason for self-producing was quality, followed by price, avoiding the black market, selection of a specific strain of cannabis, and safety. Of those who reported that someone else produced CTP for them, two thirds had designated producers who were licensed. More than a third of them reported having difficulties finding a designated producer.

Accessibility

Accessibility refers to the influence of provincial region of residence and community type (i.e. rural, suburban, and urban) on access both to physicians to obtain support for an authorization to possess CTP and to a source of CTP. Table 3 summarizes the key findings for accessibility. The rate of experiencing obstacles to access to CTP did not differ according to provincial region or community type. The proportion of those who had spoken to a physician regarding CTP use varied according to region, with the highest level

Table 3
Accessibility: Influence of provincial region and community type on access.

Obstacles
- No difference in rate of experiencing obstacles to access to CTP by provincial region[a] ($\chi^2 = 5.32$ (4), $p = .27$) or community type[b] ($\chi^2 = 1.39$ (2), $p = .50$).

Physicians
- Regional differences in proportion of respondents who had spoken to a physician regarding CTP use ($\chi^2 = 16.58$ (4); $p < .01$); highest in British Columbia (88%, $n = 191$) and lowest in the Maritimes (71%, $n = 29$).
- Rural respondents more likely than urban and suburban respondents to discuss CTP with physicians ($\chi^2 = 7.59$ (2); $p = .02$): 89% ($n = 116$) rural, 80% ($n = 224$) urban, 77% ($n = 144$) suburban
- No difference in the proportion of respondents who reported changing physicians for reasons related to CTP across provincial regions ($\chi^2 = 3.11$ (4); $p = .54$) or community types ($\chi^2 = .19$ (2); $p = .67$).

Application for authorization
- Rural residents more likely to report having received federal authorization to possess CTP compared to suburban and urban dwellers ($\chi^2 = 8.69$ (2), $p = .01$): 41% ($n = 45$) rural, 36% ($n = 58$) suburban, 26% ($n = 63$) urban.

Access to a source of CTP
- Regional differences in the proportion of respondents who accessed CTP from a medical cannabis dispensary ($\chi^2 = 62.61$ (4); $p < .01$), with higher levels in British Columbia (70%, $n = 118$) and Ontario (41%, $n = 68$) and lower levels in the Prairies (18%, $n = 11$) and Maritime (25%, $n = 7$).
- Complementary regional differences in the proportion of respondents who accessed CTP from a friend or acquaintance ($\chi^2 = 18.23$ (4), $p < .01$), with higher levels in the Prairies (80%, $n = 52$) and Maritimes (88%, $n = 28$) and lower levels in British Columbia (58%, $n = 106$).
- Self-production of cannabis differed by community type ($\chi^2 = 18.25$ (2); $p < .01$), with the highest level among respondents from rural areas (48%, $n = 51$), followed by suburban (31%, $n = 46$) and urban residents (25%, $n = 58$).

[a] Provincial regions include British Columbia, the Prairies (Alberta, Saskatchewan, Manitoba and the Northwest Territories), Ontario, Quebec, and the Maritimes (New Brunswick, Nova Scotia, Newfoundland and Labrador and Prince Edward Island).
[b] Community type refers to self-reported urban, suburban or rural area of residence.

in British Columbia and lowest in the Maritimes. Across regions, respondents from rural areas were more likely than urban or suburban respondents to discuss CTP with physicians. The proportion of respondents who reported changing physicians for reasons related to CTP use was stable across provincial regions and community types. Rural residents were more likely to report having received federal authorization to possess CTP relative to suburban and urban dwellers.

With regard to accessibility to sources of CTP, regional differences were identified in the proportion of respondents who accessed CTP from a medical cannabis dispensary, with higher levels among respondents from British Columbia and Ontario and lower use among residents of the Prairies and Maritimes. A complementary pattern of results emerges from examining access to cannabis from a friend or acquaintance, with higher levels among residents of the Prairies and Maritimes and lower levels from British Columbia. Fig. 3 provides a detailed breakdown of sources of CTP by provincial region. Self-production of cannabis differed by community type, with the highest level of self-production among respondents from rural areas, followed by suburban and urban residents.

Availability

Availability in this context refers to how medical conditions and general quality of health impact availability of physicians to support applications to access CTP, the responsiveness of the federal government's administrative process required to obtaining authorization to possess CTP, and the availability of sources of CTP. Table 4 summarizes key findings related to availability. The rate of experiencing obstacles to access to CTP differed across medical conditions, such that individuals who identified HIV/AIDS as their primary condition were less likely to report obstacles. Physician communication also varied according to medical conditions, such that a greater proportion of individuals with HIV/AIDS and arthritis discussed CTP with physicians, whereas respondents with anxiety/depression as primary condition were less likely to discuss CTP with physicians. Respondents with HIV/AIDS were also relatively less likely than other patients to change physicians for reasons related to CTP. Having physicians recommend CTP but refuse to endorse applications for authorized access was less prevalent among respondents with HIV/AIDS, and more common among respondents with chronic pain that was not due to spinal injury or arthritis.

To maximize power and facilitate interpretation we dichotomized health status into *fair to poor* (34%, $n = 162$) and

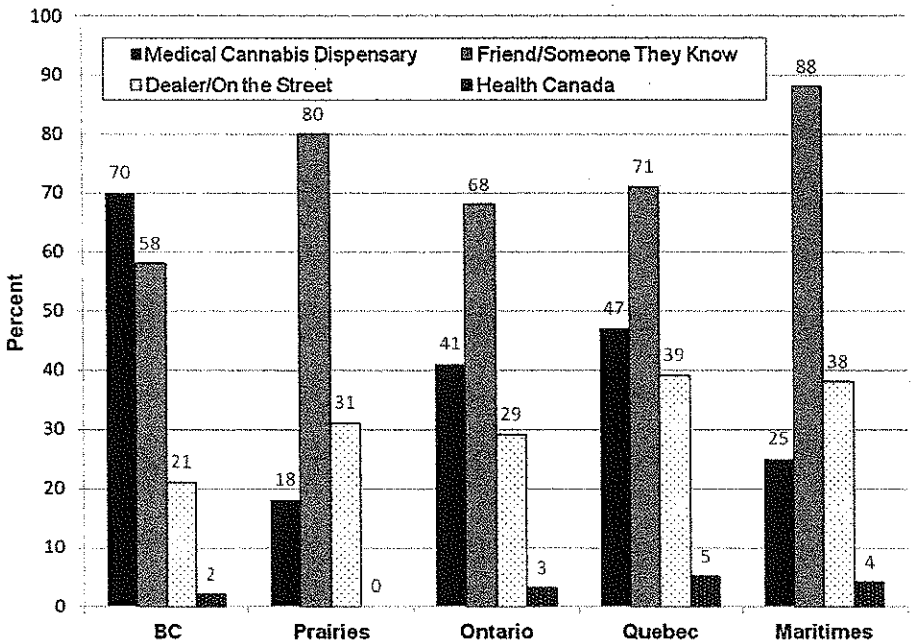

Fig. 3. Sources of purchased cannabis for therapeutic purposes by provincial region.

Table 4
Availability: Impact of medical conditions and general quality of health on access.

Obstacles
- Individuals who identified HIV/AIDS as their primary condition were less likely to report experiencing obstacles to access to CTP than other respondents (70%, $n=33$) ($\chi^2=10.29$ (1), $p<.01$).
- No differences in experiencing obstacles to access to CTP according to reported general health status ($\chi^2=.16$ (1); $p=.68$),

Physicians
- Compared to respondents with other medical conditions, respondents living with HIV/AIDS were:
  - more likely to discuss CTP with physicians (93%, $n=55$) ($\chi^2=5.51$ (1); $p=.02$).
  - less likely than other patients to change physicians for reasons related to CTP (11%, $n=6$) ($\chi^2=13.14$ (1); $p<.01$).
  - less likely to have physicians recommend CTP but refuse to endorse applications for authorized access (13%, $n=7$) ($\chi^2=10.90$ (1); $p<.01$),
- Respondents with arthritis were also more likely than other respondents to discuss CTP with their physician (91%, $n=80$) ($\chi^2=4.54$ (1); $p=.02$).
- Respondents with anxiety/depression were less likely to discuss CTP with a physician (64%, $n=69$) ($\chi^2=27.68$ (1); $p<.01$).
- Respondents who reported *fair to poor* general health were more likely than respondents who reported *good to excellent* general health to discuss CTP with a physician (91%, $n=147$) (77%, $n=240$) ($\chi^2=13.59$ (1); $p<.01$),
- No differences according to general health status in changing physicians related to CTP ($\chi^2=.39$ (1); $p=57$), or having physicians recommend CTP but refuse to endorse an application for authorization ($\chi^2=.08$ (1); $p=81$).
- Respondents with chronic pain that was not due to spinal injury or arthritis were more likely to have physicians recommend CTP but refuse to endorse applications for authorized access (51%, $n=40$) ($\chi^2=12.43$ (1); $p<.01$).

Application for authorization
- Respondents who reported *fair to poor* general health were more likely than respondents who reported *good to excellent* general health to have obtained federal authorization (42%, $n=68$) (27%, $n=85$) ($\chi^2=10.59$ (1); $p<.01$)

Access to an authorized source of CTP
- Respondents who reported *fair to poor* general health were more likely than respondents who reported *good to excellent* general health to access CTP through authorized means (36%, $n=57$) (25%, $n=76$) ($\chi^2=6.00$ (1); $p=.02$).
- The proportion of licensed versus unlicensed self-producers was consistent across medical conditions ($\chi^2=2.01$ (8); $p=.98$).
- Self-producers of CTP who reported *fair to poor* general health were more likely to be licensed (64%, $n=30$) than were those who reported *good to excellent* general health (42%, $n=43$) ($\chi^2=6.05$ (1); $p=.01$).
- The proportion of self-producers who reported difficulty in learning to cultivate was consistent across medical conditions ($\chi^2=9.04$ (8); $p=.34$) and general health quality ($\chi^2=.39$ (2); $p=.58$).
- The proportion of respondents reporting difficulties finding a designated producer was stable across medical conditions ($\chi^2=7.14$ (8); $p=.52$) and health quality ($\chi^2=.27$ (1); $p=.66$).

Table 5
Affordability: Ability to pay for access to CTP according to income.

Physicians
- Income was not associated with discussing CTP with a physician ($\chi^2=1.48$ (3); $p=.69$) or with changing physicians for reasons associated with CTP ($\chi^2=1.14$ (3); $p=.79$).
- 40% ($n=98$) of applicants were charged by physicians for the service of having their application completed, with charges ranging from $10 to $800.
- a relatively smaller proportion of the lowest income group (≤$20,000/yr) were charged (30%, $n=26$, $\chi^2=7.18$ (1); $p<.01$), and a larger proportion of the $40,000–60,000/yr group were charged (62%, $n=21$, $\chi^2=6.76$ (1); $p=.01$).

Application for authorization
- 40% ($n=68$) of respondents in the lowest income group obtained authorization compared to 28% ($n=95$) of respondents from higher income groups ($\chi^2=6.86$ (1); $p=.01$).

Access to a source of CTP
- Among participants who reported buying CTP ($n=433$), the median amount reportedly spent was $200 (Inter-quartile Range = $100-$400) per month.
- 54% ($n=278$) of respondents reported that they were *sometimes or never* able to afford to buy sufficient quantity of CTP to relieve their symptoms
- Respondents in the lower income group were most likely to report that they were *sometimes or never* able to afford to buy sufficient quantity of CTP (72%, $n=123$) and those in the highest income group (≥ $60,000/yr) were least likely (30%, $n=36$) ($\chi^2=51.26$ (3); $p<.01$).
- 33% ($n=173$) reported that they often or always choose between cannabis and other necessities (e.g. food, rent, other medicines) because of lack of money, with the highest levels of reporting among lowest income (51%, $n=88$) and lower levels at highest income (11%, $n=13$) ($\chi^2=56.93$ (3); $p<.01$).
- 67% ($n=107$) of respondents who reported *fair to poor* general health were *sometimes or never* able to afford sufficient CTP compared to 48% ($n=147$) of respondents who reported *good to excellent* health ($\chi^2=15.56$ (1); $p<.01$).
- Respondents reporting poorer health were nearly twice as likely to report choosing between CTP and other necessities (48% ($n=78$) versus 25% ($n=79$), $\chi^2=25.85$ (1); $p<.01$).
- Income was not associated with accessing CTP from an authorized source ($\chi^2=2.61$ (3); $p=.46$).

good to excellent (66%, $n=313$), based on a median split and parsimony. Respondents who reported *fair to poor* general health were more likely than respondents who reported *good to excellent* general health to discuss CTP with a physician, to have obtained federal authorization, and to access CTP through authorized means. However, comparisons according to general health of respondents identified no differences with regard to experiencing obstacles, changing physicians related to CTP, or having physicians recommend CTP but refuse to endorse an application for authorization.

With regard to sources of CTP, the proportion of licensed versus unlicensed self-producers was consistent across medical conditions. However, self-producers who reported *fair to poor* general health were more likely to be licensed than were those who reported *good to excellent* general health. The proportion of self-producers who reported difficulty in learning to cultivate was consistent across medical conditions and general health quality. The proportion of respondents reporting difficulties finding a designated producer was stable across medical conditions and health quality.

Affordability

Affordability refers to costs associated with CTP and ability to pay according to income. Costs to access CTP occur both in the process of obtaining physician support for authorization to possess CTP and in obtaining a supply of cannabis. Table 5 summarizes the key findings related to affordability. Many applicants were charged by their physician for the service of having their application completed, with charges ranging from $10 to $800. A relatively smaller proportion of the lowest income group and a larger proportion of the $40,000–60,000/year group were charged.

Among participants who reported buying CTP, the median amount spent was $200 (Inter-quartile Range = $100–$400) per month. More than half of respondents reported that they were *sometimes or never* able to afford to buy sufficient quantity of CTP to relieve their symptoms, and approximately one third reported that they often or always choose between cannabis and other necessities (e.g. food, rent, other medicines) because of lack of money. The proportion of respondents who reported that they were *sometimes or never* able to afford to buy sufficient quantity of CTP differed according to income such that it was most frequently reported by the lower income group and least frequently reported by the highest income group. The frequency of reports of choosing between CTP and other necessities followed a similar pattern, with highest levels of reporting among lowest income and lower levels at highest income.

Table 6
Acceptability: Patients' perceptions of physicians' attitudes with regard to CTP.

Physicians
• 48% (n = 277) reported that they had at some time wanted to discuss CTP with *a* physician but had not done so.
• 38% (n = 105) had not discussed CTP with *any* physician.
• The most frequent reason for not discussing CTP despite a desire to do so was "don't feel comfortable" (62%, n = 172), followed by "illegal" (46%, n = 127), and "can't afford cannabis" (9%, n = 25).
• Reported reasons for respondents avoiding CTP in the past included: "I could be discriminated against" (60%, n = 326), "Doctors might find it annoying to be asked about cannabis" (51%, n = 275), "Discussing cannabis could distract a doctor" (17%, n = 90) and "It could make me drowsy" (17%, n = 90).
• Reported perceived negative responses from physicians to CTP included: "After multiple negative responses from doc, I've stopped broaching the subject."; "He shut me down every time I brought it up."
• Respondents feared a negative impact on their patient/physician relationship: "fear of getting no treatment at all"; "fear of losing my doctor"; "I am afraid they will black list me as a patient and I would not have access to health care!"
• Compared to their communication with their physician regarding other medical issues, 50% (n = 235) of respondents were less satisfied with their communication about the use of CTP, and 31% (n = 146) reported that they often or always felt discriminated against by their physician because of their use of CTP.

The proportion of respondents who reported financial strain associated with CTP varied according to health status such that approximately two thirds of respondents who reported *fair to poor* general health were *sometimes or never* able to afford sufficient CTP compared to almost half of respondents who reported *good to excellent* health. Respondents reporting poorer health were also nearly twice as likely to report choosing between CTP and other necessities.

The proportion of respondents who obtained authorization varied according to income, such that a greater proportion of respondents in the lowest annual income group obtained authorization compared to respondents from higher income groups. Income was not associated with discussing CTP with a physician or with changing physicians for reasons associated with CTP. Income was also not associated with accessing CTP from an authorized source.

Acceptability

Acceptability refers to patients' perceptions of physicians' attitudes regarding CTP and of the federal program, as well as indices of patient–physician communications. Table 6 summarizes the key findings related to acceptability. Respondents reported some reluctance regarding communication with physicians related to CTP. Approximately half of the respondents reported that they had at some time wanted to discuss CTP with *a* physician but had not done so. Among respondents who wanted to discuss CTP but refrained, more than one third had not discussed CTP with *any* physician. The most frequent reason for not discussing CTP despite a desire to do so was "don't feel comfortable", followed by "illegal", and "can't afford cannabis".

Although our sample was comprised of *current* users of CTP, queries regarding *past* avoidance of CTP also evinced patient concerns regarding potential reactions from physicians and others. The most frequently cited reason for avoiding CTP was "I could be discriminated against", followed by "Doctors might find it annoying to be asked about cannabis", "Discussing cannabis could distract a doctor" and "It could make me drowsy".

Answers to an open ended question related to physicians' perceived negative response to CTP included: "After multiple negative responses from doc, I've stopped broaching the subject."; "He shut me down every time I brought it up." Several responses also indicated concern that discussing CTP with a physician might have a negative impact on their patient/physician relationship: "fear of getting no treatment at all"; "fear of losing my doctor"; "I am afraid they will black list me as a patient and I would not have access to health care!" Compared to their communication with their physician regarding other medical issues, half of the respondents were less satisfied with their communication about the use of CTP, and almost one third reported that they often or always felt discriminated against by their physician because of their use of CTP.

Discussion

Utilizing a health services analytical framework, we examine barriers to access to CTP in terms of dimensions of *accommodation, accessibility, availability, affordability, and acceptability*. This in-depth analysis of barriers to access to CTP provides insights into access to CTP under the MMAR and may more broadly inform the safe, efficient and equitable provision of CTP under future programs. Our results suggest that, under the MMAR, Canadians faced substantial barriers to both legal authorization to possess CTP and access to a source of CTP. In addition, based on our findings, we conclude that many of these barriers do not appear to be addressed by the new MMPR and that the MMPR may exacerbate some barriers to access, particularly with regard to affordability.

Finding a physician to support an application to access CTP is a challenge for many Canadians who use CTP. Obtaining authorization to possess CTP requires the support of a physician, and the majority of respondents had discussed the use of CTP with a physician. However, a large proportion of respondents spoke to several physicians and many changed physicians in order to access CTP. Ultimately, less than one third of respondents had obtained authorization that allowed them to legally possess CTP, suggesting that despite the existence of a legal framework, a substantial number of chronically and seriously ill Canadians continue to access CTP without legal authorization and from illegal sources. This discrepancy may point to poor *accommodation* of the federal CTP program to client needs. Indeed more than 85% of respondents reported experiencing obstacles to accessing CTP. Among the minority of respondents who engaged with the federal program, over half found the process difficult, and nearly half were dissatisfied with the program.

Under the new MMPR, Canadians will need to obtain a medical document similar to a prescription from a physician or a nurse practitioner in order to have legal access to CTP. Given the reservations physicians had with signing a medical declaration on the application form under the MMAR, it is possible that physicians will be even more reluctant to prescribe CTP within the new regulatory framework, as noted in a recent statement by the Canadian Medical Association citing insufficient clinical evidence regarding CTP (Canadian Medical Association, 2013). Our findings support the need to build a stronger body of evidence regarding the appropriate therapeutic uses of cannabis for specific conditions as well as the need to better inform physicians of the evidence that *does* exist. Nurse practitioners will be allowed to prescribe CTP under the new MMPR in jurisdictions where they can prescribe, though it remains to be seen whether this will result in better access to CTP.

The current system also fails to accommodate access to a legal source of CTP. Among those who managed to obtain access to authorized sources of CTP (direct purchase from Health Canada, licensed self-production or licensed designated production), three quarters also accessed unauthorized sources. Only 7% of our sample accessed CTP exclusively from authorized sources, which suggests substantial barriers to efficient and acceptable authorized access.

The MMAR did not include medical cannabis dispensaries within the regulatory system, now do the new MMPR. The omission of

dispensaries from the revised regulatory framework may serve to maintain barriers to access; our findings suggest that *accessibility* to CTP was associated with the presence of medical cannabis dispensaries. British Columbia and Ontario have numerous medical cannabis dispensaries, whereas other regions have few, if any, dispensaries. Our finding of regional differences in the *accessibility* to CTP, with residents in BC and Ontario more likely to access CTP from a dispensary, was expected. Other regional differences may also be attributable to the presence of dispensaries. Specifically, BC has the greatest density and longest history of dispensary activity (Lucas, 2012b), and BC residents were more likely to have discussed CTP with a physician and less likely to purchase CTP from a friend or acquaintance. Although the cross-sectional nature of our study prevents assertions regarding causality, these findings suggest that services offered by medical cannabis dispensaries may reduce barriers in terms of *accommodation* by increasing options for sources of CTP, available strains and products, *accessibility* in terms of geographic location and store front services, and *acceptability* in terms of increasing physician consultation around CTP and reducing prevalence of illegal access through friends and acquaintances.

Access to CTP varied by medical condition and general quality of health. In particular, our findings indicate that respondents living with HIV/AIDS experienced fewer obstacles, were more likely to discuss CTP with physicians, less likely to change physicians related to CTP, and less likely to have physicians recommend CTP but refuse to endorse authorization. The relatively lower levels of obstacles faced by people living with HIV/AIDS may be attributed to several factors, including the relatively more established efficacy of the therapeutic uses of cannabis for the management of symptoms related to HIV/AIDS, the long history of grassroots advocacy for the use of CTP by the HIV/AIDS movement, and the potentially greater alliance between health care providers and patients among this community. These findings suggest that further research into factors that have facilitated access to CTP among people living with HIV/AIDS might help develop strategies to improve access for other groups. These findings also raise the possibility that prior research that focused exclusively on HIV/AIDS patients who use CTP (e.g. Belle-Isle & Hathaway, 2007) may present an underestimate of the obstacles experienced by the broader community of people who use CTP.

Also related to the dimension of *availability*, individuals who identified anxiety and/or depression as primary reasons for using CTP were less likely to discuss CTP use with physicians. This difference may reflect characteristics of these conditions, as behavioral inhibition and reduced communication may be associated with depression and anxiety (Angélico, Crippa, & Loureiro, 2013; Tse & Bond, 2004). This finding may also reflect concerns regarding stigmatization as the stigmas associated with mental illness and with cannabis use may combine to create a formidable barrier to open patient–caregiver communication. Alternately, this finding may reflect perceived reluctance on the part of physicians to recommend CTP for psychiatric symptoms. Given the prevalence of anxiety and depression in the general population, and the substantial problems with extant pharmacological treatments such as benzodiazepines and SSRIs (Gartlehner et al., 2011; Uzun, Kozumplik, Jakovljević, & Sedić, 2010), our findings of high levels of unauthorized CTP use to address these conditions suggest that further effort is required to better determine the antidepressant and anxiolytic efficacy of CTP.

General health status was also associated with difference in the availability of CTP, such that poorer health was associated with higher rates of physician communication and authorized access. Perhaps this finding indicates that Canadians wait until they are in desperate need of therapeutic options where other options have failed before they gather enough courage to speak to their physician about CTP. Perhaps physicians are more comfortable supporting the use of CTP for Canadians who are in poorer health. Further inquiry could shed light on this finding. However, no differences according to general health status were observed with regard to experiencing obstacles to access, changing physicians related to CTP and physicians recommending CTP but refusing to endorse applications for authorized access. Nevertheless, our findings indicate that over a quarter of patients in poor health had the experience of physicians recommending CTP and refusing to assist with authorization. This finding points to the need for further education to address equivocation and reluctance on the part of physicians to assist patients in obtaining legal access to CTP.

Affordability of CTP is a significant barrier to access for many. Under the MMAR, Health Canada offered its cannabis at $5 CDN per gram, plus applicable taxes. Cannabis on the street market ranges between as low as $7 per gram to as high as $28 per gram in Canada's northernmost region (priceofweed.com). Medical cannabis dispensaries tend to follow street market prices or offer cannabis at slightly lower cost, sometimes with sliding scale prices or limited donations for lower income clients (Lucas, P., pers. commun.). Commercial licensed producers offer cannabis between $6 and $12 per gram, confirming that the price of CTP increased as indicated in the government's Regulatory Impact Analysis Statement regarding the new MMPR (Government of Canada, 2012).

Our findings reveal that over half of respondents indicated that financial considerations interfered with their ability to treat symptoms with cannabis. Lower income individuals were most vulnerable to this obstacle, with approximately half of participants in the lowest income group reporting having to choose between CTP and other necessities. However, even a third of the highest income group reported difficulty affording CTP. Affordability appeared to disproportionately impact the most seriously ill patients, such that the group who reported fair to poor health were twice as likely as healthier patients to report having to choose between CTP and other necessities. Surprisingly, the lowest income group were more likely to have obtained authorization to possess, which suggests that it is the cost of cannabis per se, rather than the cost of obtaining authorization, that presents the primary barrier to affordability. The ubiquity of CTP-related financial strain highlights the need for developing approaches to mitigate financial barriers and integrate CTP within a subsidized medicine framework. This is increasingly important under the new MMPR, since Canadians who use CTP no longer have the cost-effective options of producing their own cannabis or obtaining a designated producer.

Finally, barriers to acceptability due to stigma and controversy that surrounds the use of CTP need to be addressed. In light of this stigma and controversy (Bottoroff et al., 2013), and evidence from surveys of physicians that indicate discomfort with CTP (Canadian Medical Association, 2012; Jones & Hathaway, 2008), we were not surprised that patients' perception of service providers' attitudes toward CTP users constituted substantial barriers to *acceptability* of services. Our findings allude to impeded frank and open discussions about CTP and a negative impact on continuity of care.

Indeed, almost half of the respondents had at some point wanted to discuss cannabis for medical purposes with a physician but avoided doing so, most commonly citing fear of discrimination and feelings of discomfort. Reports of patient–physician interaction suggest that such fears may not be unfounded; half of respondents were relatively less satisfied with CTP-related physician interactions than with interactions that were unrelated to CTP, and nearly one third reported experiencing CTP-related discrimination on the part of physicians. The large proportion of patients who changed doctors to access CTP, and who reported that physicians recommended CTP but would not sign official authorizations, provides further evidence of lingering discomfort related to CTP on the part of some physicians. This discomfort may stem from their stated

lack of knowledge about the medical use of cannabis (Canadian Medical Association, 2012; Jones & Hathaway, 2008) and their disapproval of smoking as a route of administration for any treatment (Canadian Medical Association, 2012). It may also stem from their personal views on cannabis use, which may be an interesting topic for further inquiry. Organizations such as the Canadian Consortium for the Investigation of Cannabinoids have developed programs to help educate physicians on the relative harms and benefits of CTP, and the past decade has witnessed a notable increase in the international acceptance of the therapeutic potential of cannabis. This increased prominence, together with the concerted efforts of CTP advocates and educators, may play a valuable role in helping to reduce barriers related to acceptability of services.

The ongoing prohibition of cannabis and associated anti-cannabis messages have tarnished its reputation as a potentially beneficial and safe therapeutic option, thwarted scientific inquiry and stigmatized both the plant and its users. Perhaps the current international climate of cannabis policy reform will bring about alternative policies to regulate cannabis and will slowly open doors for more rational and sensible investigation and education regarding its therapeutic uses.

Our study has several limitations. The cross-sectional nature does not permit causal inferences and it is possible that unmeasured factors may play an important role in determining access to CTP. Our sample consisted of mostly male, Caucasian and well educated respondents and our findings may not reflect the situation of other Canadians who use CTP. An additional limitation involves response biases related to participant self-selection, and recruitment through organizations that support people who use CTP. These factors likely resulted in overrepresentation in our sample by individuals who are strongly invested in increasing access to CTP. Conversely, barriers to access to CTP may be greater for those who may not have access to online resources or organizations that support people who use CTP. We also focused on barriers to access for those who are using CTP and did not delve into the barriers for people who may want to use CTP but are not able to overcome barriers to access. In light of these factors replication using a more systematic approach to recruitment is required to conclusively determine the extent to which the CTP users in our sample are representative of the broader community of Canadian CTP users. Also, our use of broad diagnostic categories and a single item measure of global health provide somewhat crude indices of health status. Although the use of discrete categories and single item measures of health are widely used (Bowling, 2005), future studies that employ more fine-grained assessments might provide additional valuable information.

These limitations are balanced by several strengths, including a relatively large national sample that tapped into both authorized and unauthorized CTP users across diverse medical conditions and health statuses. The engagement of both community and academic experts in the construction and dissemination of the survey is a further strength of our study, as it increased the breadth, relevance and validity of our queries. More broadly, our examination of issues related to access to CTP was guided by a theoretically informed analytical framework which added to our confidence regarding the dimensions that are central to access to health services.

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Conflict of interest statement

None declared.

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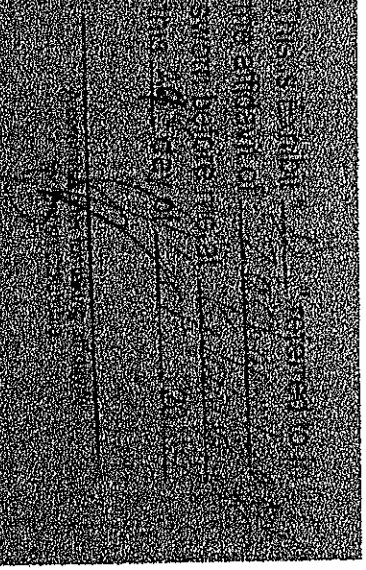
CANNABIS ACCESS FOR MEDICAL PURPOSES SURVEY (CAMPS): PATIENT CHARACTERISTICS, PATTERNS OF USE & BARRIERS TO ACCESS



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- Jamie Marshall, Interior Health Authority
- Trevor Stratton, Canadian Aboriginal AIDS Network
- Michael Woodworth, Department of Psychology, UBC

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Methods

- Cross-sectional national & local online & in person
- 628 self-selected current users of cannabis for therapeutic purposes
- Collected between July 2011 and August 2012

Demographics

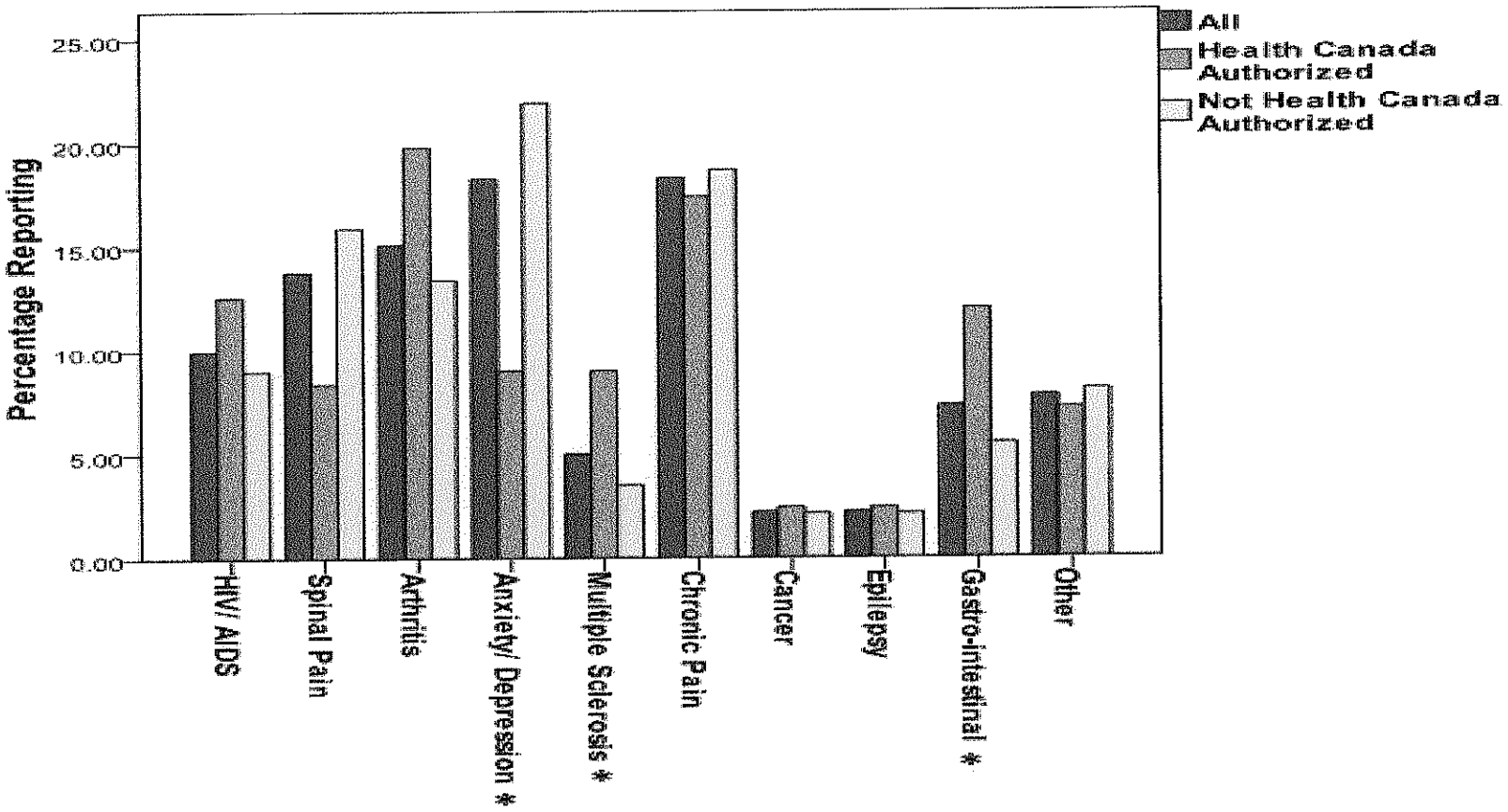
	CTP (%)	Census (%)	Z
% male	71	49	11.03*
% white	92	80	7.52*
% aboriginal	7	4	3.80*
Age			
18-24yrs old	17	12	3.86*
25-34	26	16	6.84*
35-44	19	20	.63
45-54	24	20	2.51

Demographics

	CTP(%)	Census (%)	Z
Education			
<high School	4	15	-7.86*
HS Grad	37	24	7.63*
post secondary	58	61	-1.54
Income			
<20,000	33	44	-5.55*
20,000-39,999	26	27	-.56
40, 000-59,999	17	15	1.43
60,00 +	24	14	7.22*
Region			
Rural	22	20	1.25

Medical Conditions – Authorized / Unauthorized

32.49% Health Canada authorized (12.45% in process)



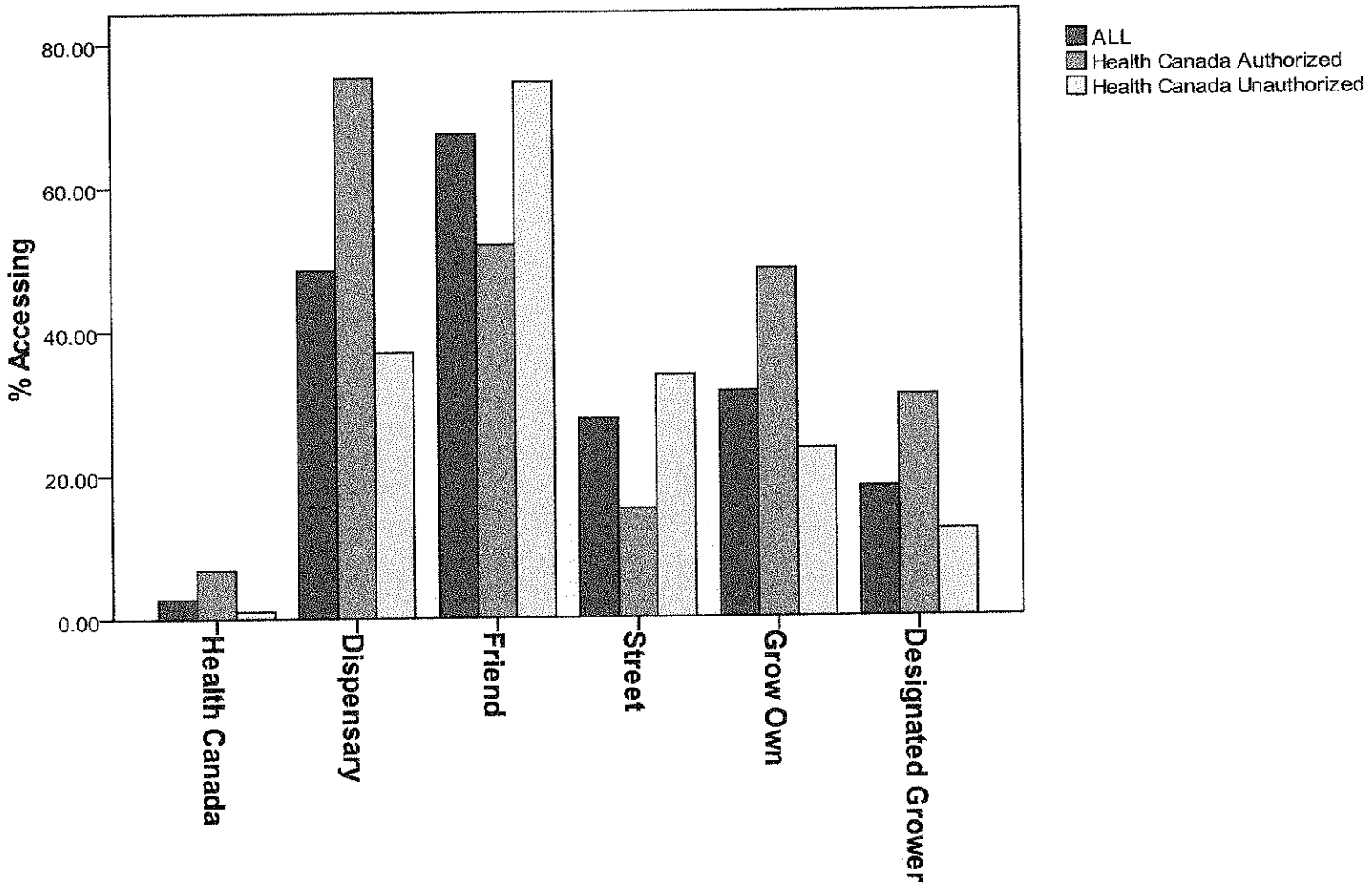
Medical Conditions - Symptoms

	All	Pain – Spinal	Pain - Nonspinal	Arthritis	Mood	HIV/AIDS	GI
Sleep	85.3%	82.9%	85.3%	89.9%	92.5%	78.3%	76.7%
Pain	81.8%	97.6%**	93.6%**	96.6%**	52.3%**	68.3%**	93%
Anxiety	78.3%	79.3%	78%	64%**	99.1%**	73.3%	67.4%
Depression	66.1%	67.1%	62.4%	57.3%	91.6%**	56.7%	62.8%
Appetite/ Weight	56.0%	52.4%	51.4%	39.3%**	57%	76.7%**	76.7%**
Nausea	49.4%	43.9%	51.4%	37.1%	40.2%	78.3%**	81.4%**
Inflammation	48.3%	62.2%	47.7%	88.8%**	23.4%**	33.3%	58.1%
Spasms	46.8%	70.7%**	48.6%	56.2%	21.5**	33.3%	51.2%
Headache	40.5%	53.7	51.4	40.4%	35.5%	25%	27.9%

Patterns of Use

	All	Pain Spinal	Pain	Mood	Arthritis	HIV/AIDS	GI
Amount per week (Grams)							
≤2	8.8%	7.8%	9.8%	10.3%	4%	26.8%*	2.9%
2.1-5	12.6%	12.5%	12%	12.6%	13.3%	12.2%	0%
5.1-9	17.9%	10.9%	23.9%	27.6%	14.7%	14.6%	17.1%
9.1-14	16%	23.4%	16.3%	12.6%	20%	9.8%	17.1%
>14 (Median = 28)	44.6%	45.3%	38%	36.8%	48%	36.6%	62.9%
Freqency of Use							
< daily	11.1%	8.8%	12.6%	14.1%	3.9%	24.5%*	5.3%
1x day	13.5%	10.3%	15.5%	18.5%	15.6%	15.1%	2.6%
2-3x	33.2%	30.9%	30.1%	39.1%	33.8%	30.2%	36.8%

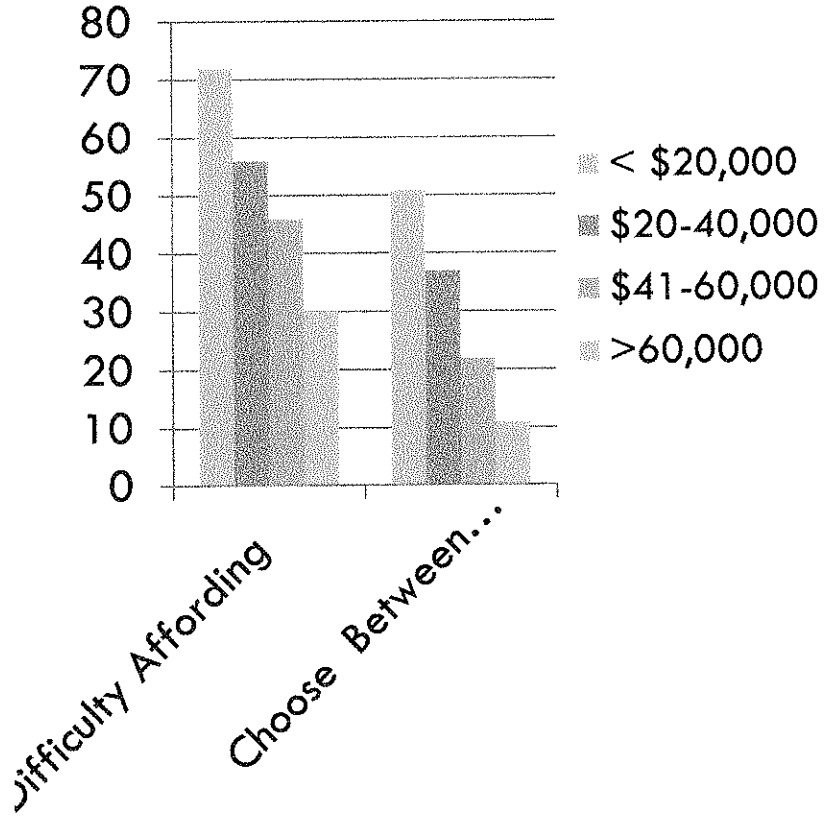
Access - Modes

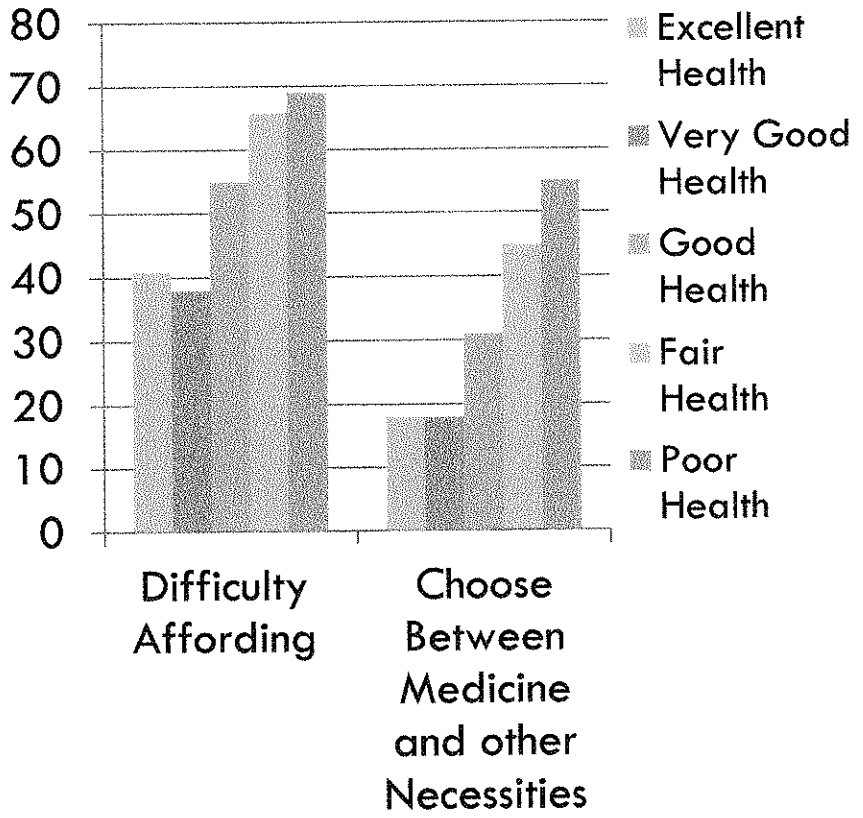


Access – Obstacles

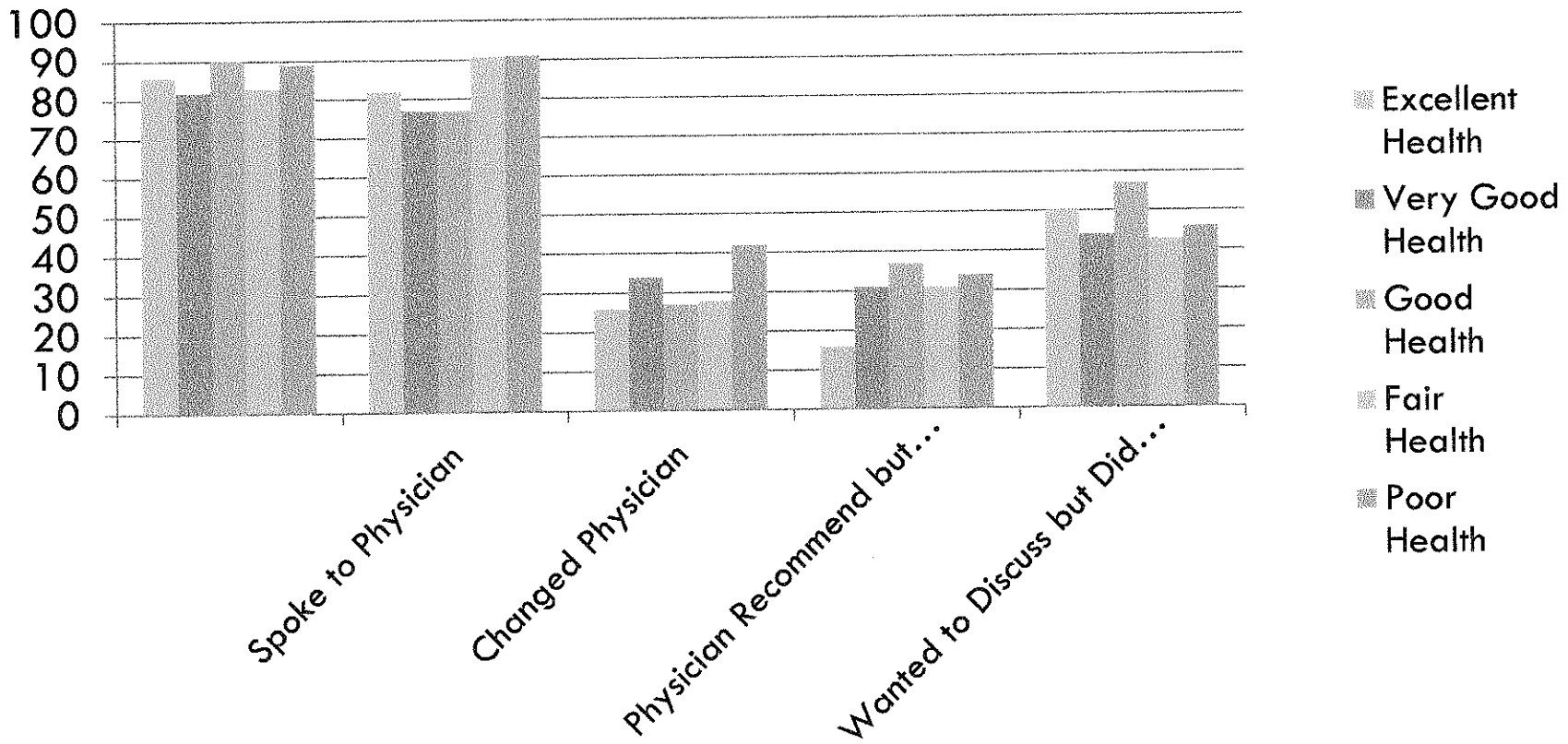
- Difficulty finding a physician to sign application:
  - 32% changed physicians
    - 38% did so once
    - 27% did so twice
    - 24% did so three times or more
  - 48% wanted to discuss cannabis but did not do so
    - fear of discrimination
    - feelings of discomfort
    - fear of annoying the physician
  - 50% relatively less satisfied with CTP-related physician interactions than with interactions that were unrelated to CTP
  - 31% felt discriminated against

Access – Affordability

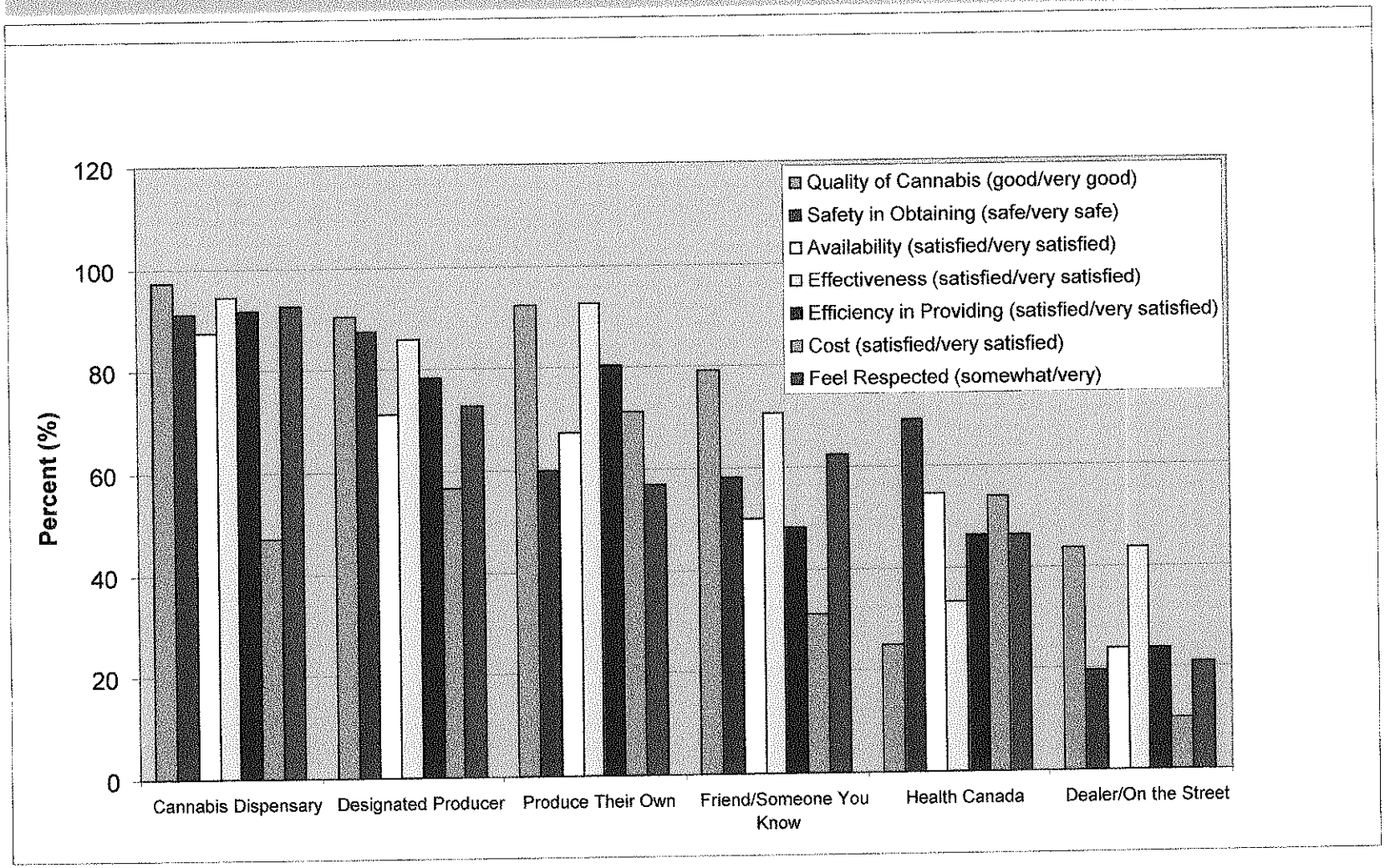




Access – Availability



Access – Modes



Discussion

- Reasons for use and perceived effectiveness were generally consistent across medical conditions; respondents overwhelmingly reported using cannabis to effectively address pain, sleep disturbance, and anxiety.

- A substantial disconnect between the medical use of cannabis and research on the risks and benefits
  - Particularly evident with regard to the anxiolytic and sedative use
  - Extrapolation from our sample to the national population of CTP users suggests that the number who use cannabis for these purposes is comparable to the number who currently use benzodiazepine and other sedatives (Kassam & Patten, 2006).

Discussion

- Authorized and unauthorized users exhibit few meaningful differences with regard to medical conditions and patterns of use, but face substantial differences regarding access
  - many seriously ill Canadians risk legal sanction and other negative outcomes associated with accessing cannabis from illegal markets.
- Medical cannabis users are nearly unanimous with regard to experiencing substantial obstacles to access
- Affordability is a substantial barrier to access – respondents from all income groups reported difficulty affording medical cannabis
  - Worse among those with the poorest health
- Physician communication is also a substantial barrier to access
  - A substantial portion of even the most seriously ill patients have had recommendations to use medical cannabis and support denied for obtaining legal access
- Medical cannabis dispensaries are the preferred mode of access across multiple dimensions of patient satisfaction

This is Exhibit "E" referred to in the affidavit of Zachary Walsh sworn before me at Kelowna BC this 29th day of Oct 2014

A commissioner for taking affidavits for British Columbia

Cost-Benefit Analysis of Regulatory Changes for Access to Marihuana for Medical Purposes

Final Report

December 2012

Prepared by:

David Stambrook, Senior Economist, Delsys Research Group Inc.

Derek Ireland, Ph.D., Senior Economist, Delsys Research Group Inc.

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Final Report

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Table of Contents

Executive Summary

The Government of Canada requires a Cost-Benefit Analysis (CBA) to be undertaken as part of the Regulatory Impact Assessment process involved in publication of certain proposed Regulations in the Canada Gazette – Part 1. This requirement was applicable for the development of the proposed Marihuana for Medical Purposes Regulations (MMPR), which will replace the existing Marihuana Medical Access Regulations (MMAR).

The Marihuana Medical Access Program (MMAP) is governed under the Marihuana Medical Access Regulations pursuant to the Controlled Drugs and Substances Act (CDSA). The current regulations came into effect in 2001 after Canadian courts ruled that individuals demonstrating a medical need for marihuana have a Charter right to possess marihuana and to have reasonable access to a legal source of supply. The MMAR provide a process for Canadians to legally obtain access to marihuana for medical purposes by applying to Health Canada for an authorization to possess (ATP) and, if applicable a license to produce.

An authorization to possess dried marihuana for medical purposes requires application by an individual to Health Canada. The individual must obtain physician support for their application to access dried marihuana.

Persons authorized by Health Canada to possess may obtain access to dried marihuana via three supply methods:

1. Government supply: purchase of dried marihuana from Health Canada through a contracted government supplier;

2. Personal-use production: under a Personal Use Production License (PUPL) to produce for their own use; or

3. Designated-person production: under a Designated Person Production License (DPPL) where another individual produces for a person authorized to possess dried marihuana.

About 60% of current persons with an ATP access marihuana through PUPL, 20% access through DPPL, 10% access through the Government supply and 10% appear to access marihuana from unknown supply sources. As of August 13, 2012 there were 21,986 ATP persons under the MMAP. The MMAP has grown at an exponential rate since its inception and has generated a number of public policy concerns.

In 2009, following the expression of significant stakeholder concerns with the current program, the Minister of Health instructed Health Canada officials to conduct a review of the MMAP. In 2011, the Government of Canada proposed changes to the regulatory framework based on the concerns that had been expressed. There was a public and targeted stakeholder consultation on these proposed regulatory reforms, which will lead to the publication of draft regulations in Canada Gazette-Part I, for which the CBA was undertaken.

Proposed Regulatory Changes

The objective of the proposed Marihuana for Medical Purposes Regulations is to reduce the risks to public health, security and safety of Canadians, while significantly improving the way in which individuals access marihuana for medical purposes.

To reduce the risks to public health, security and safety of Canadians, a new supply and distribution system for dried marihuana would be established that relies on commercial production of marihuana for medical purposes. Security requirements would be in place for the production site and key personnel of the licensed producer (LP). Standards for packaging, transportation and record-keeping would contribute to achieving security objectives.

The process for individuals seeking to access marihuana for medical purposes would no longer require application to Health Canada. Individuals would obtain marihuana, of any strain commercially available, by obtaining the support of a health care practitioner (a physician or, potentially, a nurse practitioner), and subsequently purchasing marihuana from commercial producers that are licensed by Health Canada under the proposed regulations. Quality and sanitation standards appropriate for a product for medical use will be in place. In line with other controlled substances, personal and designated production of marihuana for medical purposes would be phased-out. This would reduce the health and safety risks to individuals and to the public, while allowing for a quality-controlled and more secure product for medical use.

CBA Methodology and Results

Both quantitative and qualitative analytical methods were applied in the CBA. The study developed and applied a consistent approach to modelling the Status Quo scenario (existing policy and regulations) and the Policy scenario (proposed policy and regulations). There were four basic components of the quantitative (i.e., quantified and monetized) model for each of the two cases:

- User benefits and costs: Costs associated with the production and consumption of marihuana for medical purposes through authorized methods;
- Program administration costs: Costs borne by Health Canada in the exercise of authorization, licensing and inspection powers under the regulations;
- Safety costs: Costs associated with health and safety consequences of residential marihuana cultivation, which focus on the risk of residential fires from production licenses, especially in cases of misuse and supply of the illegal market; and
- Security costs: Costs associated with violence and home invasions directed at residential marihuana cultivation misuse and supply of the illegal market.

The quantitative analysis focused on a "Reference case" which represents the most likely outcome of the regulatory change. Sensitivity analysis of the results was undertaken by identifying key parameters associated with uncertainty/risk, and modelling a likely range and

distribution of these parameters whose impact on the results was explored probabilistically using a Monte Carlo method.

The study focused on the consumption of marihuana for medical purposes obtained from a legal source of supply. The broader issue of illicit market supply and use was considered to be outside the scope of the study. The only aspect of illegal activity that is included is the misuse of residential production licenses under the Status Quo scenario and its likely decline in the Policy scenario.

Reduction in Residential Fire Risks

The focus on safety impacts was on the risk and consequences of residential fires resulting from faulty electrical wiring, overloading of electrical circuits, tampering with electrical usage monitoring and other electrical system malfunction arising from indoor marihuana cultivation. The analysis assumed that under the proposed policy, the risks of property damage, personal injury or death resulting from marihuana production-related fires would be significantly reduced but not completely eliminated. Over the period from 2014-24, the social costs of adverse safety events related to marihuana for medical purposes production was estimated to be reduced by about 40% under the proposed regulations, at a present value of $64.32 Million. This represents annualized savings (avoided costs of property damage, injury and death from residential fires) of approximately $9.58 Million per year for 10 years.

Reduction in Risk of Break-Ins/ Home Invasion

The focus of the security impacts was on the risk and consequences of home invasion, violence targeting residential production involved in misuse, and criminal activity related to marihuana distribution on the illegal market. Information from Canadian law enforcement authorities on misuse of production licences, home invasions and shootings was used as the basis to estimate the risk of violence. Overall, the analysis valued the projected reduction in the risks of break-ins/home invasions due to the proposed policy at $0.38 Million in 2014, rising to $26.48 Million in 2024. The present value of security cost savings under the proposed policy was estimated at approximately $89.03 Million over the policy impact period, with an average annualized value of $13.27 Million. The proposed policy would have lower security costs (over 40% lower than under the status quo) due to the reduction in misuse activity that results from the expectation that eliminating personal and designated production in favour of a commercial licensing scheme would deter individuals interested in exploiting the current Program.

Program Administration Costs Savings

Under the current Program, Government administration costs have increased significantly as the number of Program participants has grown. In the absence of the proposed regulatory changes, the analysis assumed a continuation of the growth in Program applications and corresponding substantial increases in the cost to Health Canada to authorize possession and licensed production of marihuana for medical purposes, provided that program participation continues to grow at the current rate. The CBA estimated that the administration cost of the current Program would increase from $20.63 Million in 2014 to over $120M in 2024 in the

absence of any changes. These costs include salary, employee benefits and accommodation costs associated with dedicated staff, operations and maintenance costs, training, supplies and other corporate overhead costs.

Under the proposed Policy scenario, Health Canada would eliminate the role it plays in determining eligibility of persons to access a supply of marihuana for medical purposes, and return to its traditional role as a regulator of industry. This results in significant administrative cost savings over the policy impact period. Under the Policy scenario assumed for the new regulated market, the regulatory proposal was estimated to lead to more than a 90% reduction in Health Canada's administrative expenditures. The present value of administration costs savings over 10 years was estimated at $478 Million. On average, the proposed regulations would generate administrative cost savings of approximately $71.24 Million per year over this period.

Producer Surplus Gains

The proposed regulations would establish a regulated commercial market for the production and sale of marihuana for medical purposes. Private industry participation in the proposed regime is expected to yield benefits to society. Under the status quo, marihuana is either produced through private arrangements or at a cost to the tax-payer. There are no benefits to society at large beyond the benefits to the individuals involved. Under the proposed regulations, there would be beneficial impacts for the industry, over and above the benefits to the individuals involved in the market. The analysis measured this change in welfare by estimating a change in producer surplus gains under the proposed policy. No producer surplus is derived in the status quo. The CBA found that the new regulated market would generate an overall producer surplus of $2.64 Million in the first year of implementation 2014, rising to about $110 Million in 2024 as the market expanded. The present value of producer surplus gains over the policy horizon (2014-2023) was estimated at $339.85 Million or about $50.65 Million (annualized average) per year for 10 years.

Reduction in Deadweight Loss

The CBA estimated the deadweight loss under the current marihuana access regime from the effective subsidy to supply that resulted in excess demand relative to what a market equilibrium quantity would be. The value of this economic efficiency loss was relatively small as the Government supply component in the CBA model was comparatively small. Under the proposed regulations, the analysis assumes the imposition and payment of the regular consumption tax (HST) by consumers of marihuana under the proposed framework. Both the presence of an effective subsidy in the government supply market for the status quo and the assumed, potential imposition of tax on purchases in the commercial market were projected to cause welfare losses to society by distorting market signals and causing sub-optimal allocation of scarce resources.

The economic efficiency loss under the status quo was estimated to be reduced by about $1.51 Million during the first year of implementation (2014), rising to about $7.70 Million in 2024. This represents an average annualized reduction of about $5.03 Million or a total present value of approximately $33.74 Million over 10 years. Overall, the reduction in deadweight loss is small and not a significant benefit of the regulatory change.

In total, the present value of benefits of the proposed regulations was estimated to be $1.005 Billion from 2014-2024. On average, this represents an annualized savings of approximately $149.77 Million each year for 10 years.

The CBA projected the negative impacts of the proposed policy on social welfare on the basis of a change in the welfare of the individuals most directly affected by the regulatory change. Because the available scientific evidence does not conclusively support use of dried marihuana for therapeutic purposes, the causal relationships between the use of the substance and purported medical benefits are inconclusive. Thus, the analysis chose to measure the change in individual welfare under the policy directly by estimating the change in users' consumer surplus. Economic theory does not require the existence of scientifically proven medical benefit in order to measure the welfare implications of a public policy change. The observation that some in society are willing to pay to obtain marihuana for medical reasons was deemed as a sufficient basis for measuring a change in consumer welfare.

Loss of Consumer Surplus

Consumer surplus was estimated as the area under the demand curve and above the price consumers would potentially pay for marihuana under the proposed MMPR. Under the proposed policy, the analysis projected a reduction in the number of authorized users of marihuana for medical purposes vis-à-vis the Status Quo, and a reduction in the quantity consumed due to a potential increase in the price of marihuana in the regulated market. Under this scenario, the CBA predicted a significant loss of consumer surplus from this policy change.

The analysis assumes a price change from about $7.60 per gram to about $8.80 per gram over the 10 year period. This assumption reflects the potentially higher cost of producing marihuana in the new commercial market, compared to personal or designated production under the current MMAP. The higher price also reflects the potentially higher product quality due to quality control measures to limit contaminants and toxic substances and to ensure a product of consistent quality over time. The analysis assumes that this projected price change would lead to a decrease in the relative number of individuals who obtain marihuana for medical purposes from a legal source by about 30% over the next 10 years compared to the Status Quo scenario.

The total quantity of marihuana consumed was also estimated to decrease. On average, the loss in consumer surplus (representing the total social costs of the proposed regulations) was estimated to be about -$166 Million per year. The present value over 10 years was estimated to be about $1.115 Billion. (The study did not estimate consumer surplus for any consumption derived from illicit supply sources).

Business Compliance Costs

Business compliance costs were estimated as 10% of overall supply cost. On this basis, business compliance costs were estimated to be about double under the proposed Policy scenario. As business compliance costs are incorporated in the supply cost for both the Status Quo and Policy scenarios, they do not form part of the CBA. The business compliance costs mostly fall on medium and large business (as opposed to smaller businesses), as the scale of licensed producer activity (in terms of employees and sales revenue) is expected to grow beyond that of a small business after two years.

Net Present Value

The Reference case, representing the most likely outcome of the cost benefit model, was the focus of the quantified results for the net present value over a ten year forecast period from FY2014-15 to FY 2023-24. The net present value was calculated to be -$109.7 Million with an annualized value of -$16.35 Million. This loss in consumer surplus results from reduced relative growth in consumption and a higher supply price, due mostly to the shift from less-costly home production to a commercial market with appropriate regulatory controls and oversight.

The Status Quo scenario was modeled on the assumption that Government resources required to administer the current Program would continue to grow over time to fully accommodate the required Program uptake, in terms of numbers of persons wanting to access a legal source of marihuana for medical purposes. The Program administration cost was projected to increase from $13.8 Million (FY2013-14) to over $120 Million (FY2023-24). In reality, it is highly unlikely that such additional resources would be available to accommodate the forecast increase in Program participation in an era of fiscal restraint.

Results by Stakeholder

Government, especially the federal government, is the main beneficiary of regulatory change, through the reduction in Health Canada's program administration costs.

Industry, especially medium-sized business, is also a beneficiary in terms of producer surplus benefits and the expansion of a regulated industry to supply marihuana for medical purposes that could grow to more than $1.3 Billion per year in annual sales by the end of the forecast period. It is important to note that producer surplus is not related to profitability and should not be taken as such an indicator.

Households, especially users of marihuana for medical purposes authorized under the MMAR, are the stakeholder that is most impacted by the reduction in consumer surplus. The general public, in contrast, benefits slightly in terms of reduced deadweight loss and the reduced safety costs, which would be borne through residential insurance. The general public would be a major beneficiary if the government benefits were attributed to them as ultimate taxpayers.

Results by Region

Several regions have negative overall impacts, as these are dominated by the consumer surplus reduction, which is allocated based on MMAP participation. The two regions with disproportionate shares of MMAP participation (relative to population) are British Columbia and the Atlantic region (primarily Nova Scotia). Some regions are shown to have positive overall impacts as the locus of government activity is in Ontario (where there are savings from lower administrative costs) and the locus of the existing marihuana production activity is in the Prairie region.

Sensitivity Analysis

A full assessment of the sensitivity of the net present value result to all key parameters was undertaken using Monte Carlo probabilistic methods. The results showed that there was substantial variability in the estimate (a range of -$26 Billion to +10 Billion, with a mean of -$1.688 Billion).

The sensitivity analysis highlighted an inherent uncertainty regarding various impacts of the proposed regulatory change. These uncertainties arise due to:

i) the rapid growth in the number of persons wishing to access marihuana for medical purposes under the proposed supply and distribution scheme;
ii) the fundamental change that the elimination of individual production licenses will bring about;
iii) the complex dynamic behaviour that arises from: a) price elasticity effects (for non-trivial effective price change); b) deterrence effects related to criminal misuse of production licenses; and c) the market entry and price-setting mechanics and dynamics involved in the establishment of a new industry and market; and
iv) the inherently unknown outcome for the end state in FY2023-24.

There are plausible parameter values that would give rise to a very large negative net present value as well as those that would give rise to a very large positive value. The parameters with the biggest impact on the quantitative result influence the valuation of the consumer surplus (the supply costs for personal use and designated person supply and the price elasticity of demand in the status quo). The other parameters with large impacts are an affordability parameter relative to mean annual income which limits the quantity of marihuana for medical purposes consumed in the policy scenario with higher supply price; and parameters which estimate the volume of marihuana consumed in the status quo.

Qualitative Discussion

The qualitative discussion uses the major findings from the Literature Review, Stakeholder Consultations and other sources to describe some of the additional benefits, costs and risks of the regulatory change that may be important over the longer term, but cannot be quantified and monetized at this time because of data constraints and the unique attributes of the policy scenario.

Major attention is given to:

i) additional safety and security issues, impacts and possible benefits;

ii) reductions in information, administration and other transaction costs for users, the medical community and other stakeholders;

iii) the possible longer-term benefits from the full establishment of a large, competitive and innovative industry for users of marihuana for medical purposes, the economy and Canadian society; and

iv) the longer term possibility that a fully functioning and reasonably competitive, efficient and innovative market will promote the process of "reverse diversion", whereby the legal market expands at the expense of the illicit drug market.

These qualitative benefits could be substantial over the longer term, but they are highly contingent on a number of economic, social and regulatory factors and would likely become measurable and substantive only near the end of, or after, the ten-year projection period for the quantified CBA.

Conclusions

There is no Pareto efficient result that supports a statement that one option is superior. The Reference case (Policy scenario) results indicate that the sum of benefit and cost changes across all stakeholders is slightly negative. It can be characterized as being only slightly negative because the sensitivity analysis of the result shows a wide range of possible outcomes with a central tendency near zero.

One class of stakeholder bears the cost (in terms of a reduction of benefits) from consumer surplus - namely the users of marihuana for medical purposes. The remaining stakeholders (e.g., the general public, government, commercial producers) are made better off.

These results are qualified in the analysis by highlighting some of the methodological challenges facing the discipline of cost benefit analysis in such a rapidly growing Program context involving fundamental change and complex dynamic behavioural responses.

Economists measure user benefit in terms of consumer surplus. The available scientific evidence does not support the acceptance of marihuana for medical therapeutic use. However, Canadian courts have ruled that individuals have a legal right to possess marihuana for medical purposes and that the Government of Canada has a legal duty to provide reasonable access to marihuana for such purposes. The consumer surplus measure is not evidence, in any fashion, of the existence of medical benefits attributed to the consumption of marihuana for medical purposes. Therefore, the significant consumer surplus over the forecast time period that is reduced by the proposed regulatory change (due to lower consumption levels and higher supply price) may arguably be discounted by policy makers.

This analysis has monetized and quantified the benefits to be gained from reducing risks to public health and safety, to the extent possible, and these benefits are significant in number and value. The Reference case does not show these to outweigh the loss in consumer surplus. It may be that the ability of economists to apply a social valuation to these impacts may not adequately reflect a social valuation of the maintenance of public health and safety.

In addition, it is possible that there will be substantial benefits that can only be assessed qualitatively at this time. These include greater reduction in safety and security risks, reduced costs for consumers, and the benefits of establishing a competitive and innovative legal industry of marihuana for medical purposes.

This CBA report is divided into six sections:

Chapter One presents an overview of Access to Marihuana for Medical Purposes.

Chapter Two profiles Stakeholder groups who may be affected by the proposed regulatory changes: Consumers and Households; Industry; and Government.

Relevant literature on marihuana use, crime prevention and public safety, regulatory compliance and system dynamics theory are summarized in Chapter Three.

Chapter Four discusses the CBA methodology. A description of the model developed and used in deriving monetized valuations of costs and benefits for the status quo and policy scenarios is presented.

The results of the analysis as well as a discussion on qualitative effects are presented in Chapter Five, followed by a series of conclusions of the overall study in Chapter Six.

Each of these sections is discussed in detail in the next pages.

CHAPTER ONE

1.0 Overview – Access to Marihuana for Medical Purposes

Access to marihuana for medical purposes in Canada is governed under the Marihuana Medical Access Regulations (MMAR) pursuant to the Controlled Drug and Substances Act (CDSA).

The current MMAR came into effect in 2001. They provide a process for Canadians to legally obtain access to marihuana for medical purposes. Currently, persons with an Authorization to Possess (ATP) may obtain marihuana from one of three legal sources:

1. Under a Personal Use Production License (PUPL) to produce for themselves;
2. Under a Designated Person Production License (DPPL), where another designated individual can produce for them; or
3. Through purchase of dried marihuana from Health Canada through a Government Supplier.

The Marihuana Medical Access Program (MMAP), which administers the MMAR, has grown at an exponential rate from 2003 to 2012. With this growth, a number of concerns have been identified. These include:

- Escalating cost under the contract with the government supplier;
- Increasing administrative burden/cost of managing the MMAP under Health Canada;
- Negative impacts on communities and law enforcement where personal and designated production occurs; and
- Concerns from the medical community that they do not have sufficient information about marihuana for medical purposes to allow them to appropriately discuss risks and benefits with their patients.

A review of the MMAP was undertaken by Health Canada during 2010-11, which gave rise to a significant public consultation process and subsequent proposed regulatory changes.

1.1 Government Objectives

In 2010, the Minister of Health committed to a review and reform process for the MMAP with four pillars:

1. Protection of public health,
2. Safety and security;
3. Provision of reasonable access to marihuana for medical purposes; and
4. Examination of the overall costs to the Government of Canada.

1.2 Access to Marihuana for Medical Purposes

Authorization to possess marihuana for medical purposes requires application by an individual to Health Canada. The individual must obtain physician support for their access. Unlike medical therapies and drugs that are authorized by Health Canada – after scientific review of clinical studies which have demonstrated clinical efficacy and safety– dried marihuana for medical purposes has not been authorized for sale and distribution in Canada because its benefits have not been scientifically proven to outweigh its risks. This has complicated government policy, especially after Canadian courts ruled that the Government of Canada has a responsibility to ensure reasonable access to a legal source of marihuana for individual use for medical purposes.

In response to Canadian court rulings, the MMAR provide a structure that allows Canadians to access a legal supply of marihuana for medical purposes. Two categories of patient symptoms are recognized:

> Category 1: individuals who suffer various symptoms (related to Multiple Sclerosis, severe arthritis, cancer, epilepsy, HIV/AIDS, spinal cord injury/disease or for compassionate (end-of-life) care).
>
> Category 1 individuals must have a physician signature in support of the application for Authorization to Possess; and
>
> Category 2: individuals who suffer any other symptoms for which conventional treatments have been deemed inappropriate.
>
> Category 2 individuals must have a physician signature in support of the application for Authorization to Possess and an assessment by a specialist in an area relevant to the treatment of the individual's medical condition (unless the physician is such a specialist).

Once an individual has applied and been approved for an Authorization to Possess, they can:

1. Apply to access the Government Supply of dried marihuana. This is provided through a firm contracted by the government, Prairie Plant Systems (PPS), with deliveries made directly to a residence using regular courier service;

2. Apply for a 'Personal-Use Production License' (PUPL), with seeds for cultivation that are available from PPS; or

3. Designate someone else to produce on their behalf under a 'Designated-Person Production License' (DPPL) with seeds for cultivation available from PPS.

Historically, persons with an Authorization to Possess dried marihuana under the MMAR have been comprised of:

- 60% who access marihuana for medical purposes through personal production;
- 20% who access marihuana for medical purposes through designated production;
- 10% who purchase dried marihuana for medical purposes from Health Canada; and
- 10% for whom there is an unaccounted supply.

1.3 Government Supply Contract

Since 2000, the Government of Canada has contracted for the supply of marihuana for medical purposes with Prairie Plant Systems Inc. (PPS). Initially, this arrangement was established to support research on the risks and benefits associated with the use of marihuana for medical purposes.

Persons who rely on the government supply pay a flat fee of $5.00 per gram, with no additional shipping cost. The supply cost for the government supply is around $11.00 to $12.00 per gram. As a result, there is an effective subsidy to the user of more than 50% of the product cost.. This price structure was introduced in 2003 and was based on an estimated number of 300 individuals participating per year. About 2,300 persons are expected to rely on the government supply during FY2012-13.

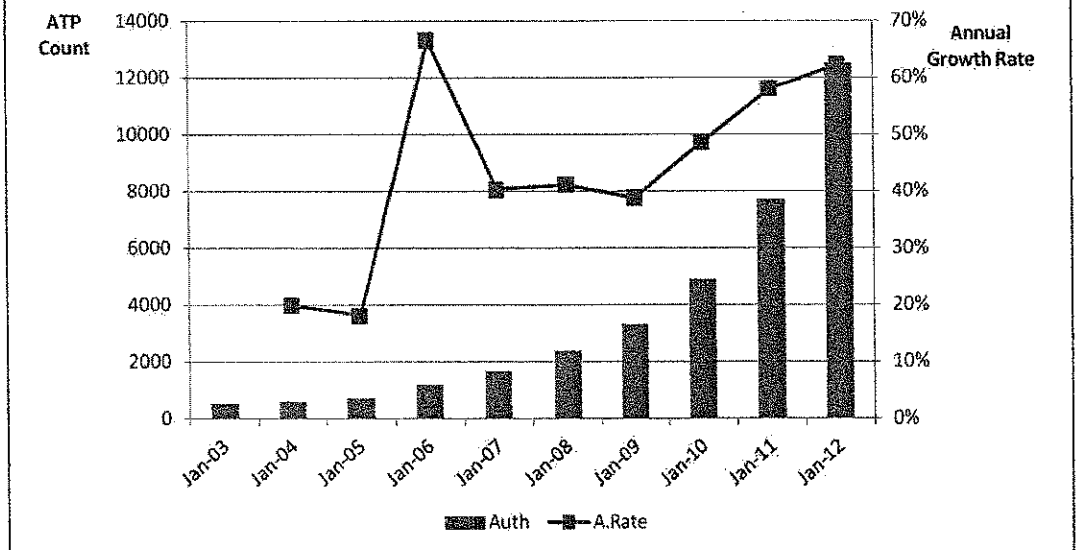
In 2003, the government supply contract was expanded to meet Court-imposed requirements, under the Canadian Constitution, to provide reasonable access to a legal source of marihuana for medical purposes to approved users. The existing contract was amended to cover the period to October 2008. The contract was then re-awarded to cover the period to October 2011. A competitive RFP process was undertaken during 2009-10 in which PPS was the successful bidder to provide the government marihuana supply through to March 2014 (including an option year).

The current (2010) contract involved an estimated contract price (over 3 fiscal years) of $16.8M with an option to extend to the 2013-14 fiscal year.

1.4 MMAP Activity Volumes

As of August 13, 2012, there were 21,986 persons with Authorizations to Possess. The exponential growth of MMAP over time is shown in Figure 1.1, which documents a nine year cumulative growth rate of 43%.

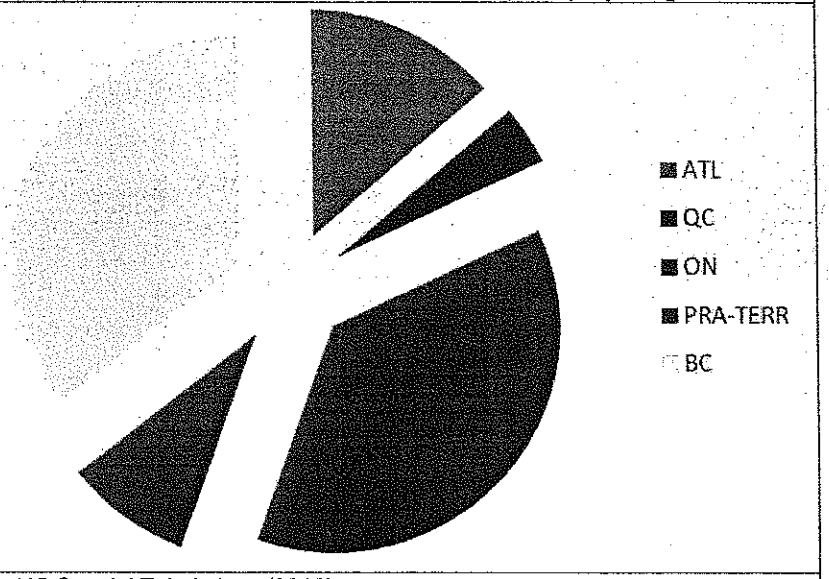
Figure 1.1 – Growth of MMAP (Persons with AP)



Source: HC website, HC data (2012)

Figure 1.2 shows Authorizations to Possess by region. Certain provinces have shares of MMAP participation that exceed their population shares, most notably British Columbia and Nova Scotia. The share of MMAP participation for Quebec is disproportionately lower than its population share.

Figure 1.2 – Authorizations to Possess (ATP) By Region



Source: HC Special Tabulations (2012)

In 85% of recent ATP applications, there was a single reported disease condition, while in 15% of cases there were two or more disease conditions reported.

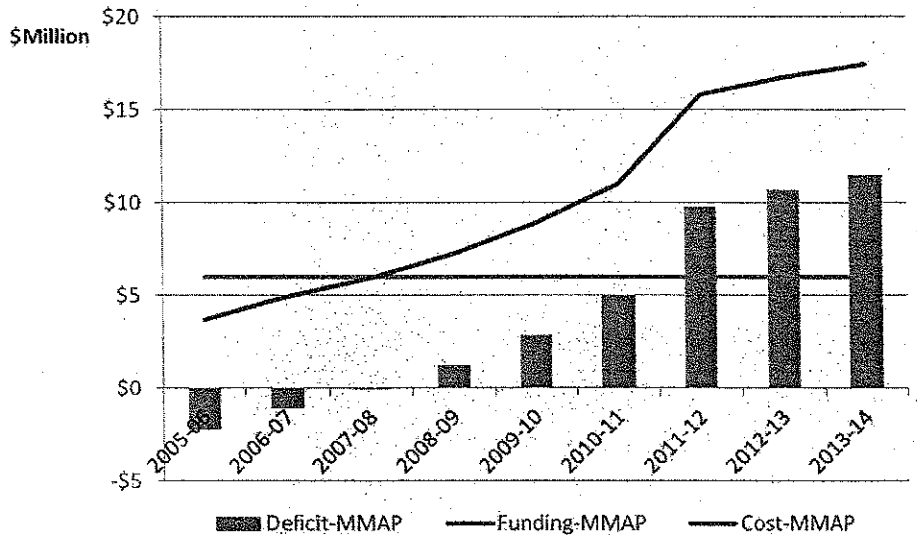
The majority (72%) of ATP applications involved Category 1 medical conditions (i.e., severe arthritis, spinal cord injury, spinal cord disease, multiple sclerosis, cancer, AIDS/HIV, epilepsy or others) while a minority (28%) involved Category 2 diseases for which a specialist (in addition to a General Practitioner) had to support the application. The Category 2 medical conditions included: chronic pain, Crohn's Disease and Hepatitis B and C.

1.5 MMAP Program Costs

Since FY2005-06, the MMAP has been resourced at an 'A-base' funding level of $6.0M per year. Against this, program costs (comprised of HC salary, O&M and corporate costs for program administration and the contract costs for the government supplier) have risen sharply in response to the exponential increase in the number of ATP-persons. This is shown in Figure 1.3, which shows program costs of $8.9M (FY2009-10) with forecast growth to $17.5M (FY2013-14). Roughly half of MMAP program costs relate to HC program administration; the other half relate to the contract costs for the production and distribution of marihuana for medical purposes.

The expected program deficit would increase from $2.9M (FY2009-10) to $11.5M (FY2013-14) and continue to grow over time. In the current fiscal restraint environment this is a major challenge.

Figure 1.3 – Forecast Growth of MMAP Costs ($Million)



Source: HC Supplemental Funding Request (2010)

1.6 Concerns with MMAP

Residential marihuana cultivation, which is authorized under PUPL and DPPL production licenses, is the primary concern related to safety and security.

Canadian law enforcement authorities have documented alleged cases of misuse of marihuana production licenses relating to diversion of product to the illicit market. Some 190 cases of alleged criminal misuse were reviewed over the period from 2003 to 2010. Some of these involved the presence of a weapon (8% of misuse cases), violent attacks and home invasion (8%) and shootings (1%). About half of the misuse incidents involved persons holding production licenses who had previous criminal records.

It may be more onerous for law enforcement to obtain an entry warrant at a residence that is a licenced production site (PUPL or DPPL) where it is believed that marihuana is being diverted to the illegal market, as the existence of this legal operation cannot likely on its own constitute reasonable and probable grounds that an offence has been committed. This means that evidence over and above the mere existence of residential marihuana production must be obtained through investigation, intelligence gathering, tips received, the presence of unusually high electrical consumption, etc., in order for police to have the requisite reasonable and probable grounds on which to obtain a search warrant for a MMAP site. This need for evidence beyond the existence of residential cultivation of marihuana is referred to in this analysis as the need for additional evidence. As stated earlier, it follows that law enforcement, under the new program, may be able to obtain search warrants with only evidence of residential cultivation, as all residential cultivation of marihuana will be illegal.

Law enforcement authorities believe that current production levels can generate much higher yields per marihuana plant than what is estimated by Health Canada for the purpose of determining the 'maximum number of plants' permitted to be grown to generate a reasonable

legal supply for medical use. Their concern is that persons have the opportunity to grow well in excess of their authorized daily amount for medical use and also supply to the illicit market from their excess supply (even if they are within the approved limit of marihuana plants).

Health Canada has limited inspection resources to ensure compliance with the conditions of production licenses in residences and cannot enter a residence without the homeowner's consent in the absence of a warrant. In 2010, Health Canada carried out inspections of 75 MMAR production license sites. Of the 27 sites for which a person answered the door, only 55% allowed inspection of the residence and 45% refused the inspection.

Residential marihuana cultivation (usually indoor hydroponic) gives rise to various safety concerns. There is an increased risk of fire associated with 'jerry-rigged' modifications to home electrical systems by unqualified individuals. It is recognized that residences used for marihuana production have a much higher risk of residential fire than a normal residence. The review based on Canadian law enforcement information of MMAP misuse identified an electrical hazard in 12% of cases and there were 2 cases (1%) where residential fires had occurred.

In addition to fire risk, the presence of high humidity (from poor ventilation of indoor cultivation) can lead to mould build-up that is associated with an increased prevalence of asthma-related symptoms such as chronic wheezing, irritation symptoms, and non-specific symptoms. There is also potential exposure to chemical contamination from pesticides and fertilizers.

There is also broader social concern with the exposure of children to marihuana through home-based marihuana cultivation. The presence of marihuana at home increases potential drug access, exposure to potential illegal activities, criminal association and possible home invasion. The police noted that children were present in 15 of the alleged misuse cases (8% exposure rate).

These concerns are addressed, where possible (given available empirical literature and empirical data), in the methodology section of this report.

1.7 Regulatory Proposal

Under the proposed regulatory changes:

- Physicians and nurse practitioners will provide the patient with a medical document which will then authorize the patient to order marihuana from a Licensed Producer (LP). The patient will then register to become a client of the LP and the LP will verify the information provided by the patient. Health Canada will play no direct role in this process;
- Residential marihuana cultivation will no longer be authorized;
- The production and distribution of marihuana for medical purposes will be restricted to producers who apply to be licensed for this purpose by Health Canada as a LP;
- Patients will register and order dried marihuana directly from an LP by phone, fax, mail or on-line and be required to provide an original medical document from an authorized health care practitioner in support of their registration;
- The LP will determine whether: a) the physician/nurse practitioner document is genuine; b) the physician/nurse practitioner document has not been tampered with; and c) the

physician/nurse practitioner is in good standing with an appropriate professional licensing authority;

- The LP will ship marihuana directly to their registered client, or to a physician/nurse practitioner, pharmacist or hospital;
- The LP 'product label' will act as necessary proof of authorization of possession of marihuana for medical purposes;
- Health Canada will manage the licensing, auditing and inspecting of LPs;
- The LP is the commercial entity that will supply dried marihuana to meet the authorized demand for the use of marihuana for medical purposes, subject to commercial viability; and
- The commercial market will determine the price of supply/demand of marihuana for medical purposes in an unregulated manner.

The proposed changes anticipate the commercial viability of LP entrants and a high degree of competition in the market, which should lead to efficient production and prices that are sufficiently competitive so as to lead to continued growth in volumes demanded by individuals with a healthcare practitioner's support to use marihuana for medical purposes.

1.8 Potential Benefits of the Regulatory Proposal

Under the proposed changes, the regulations will no longer specify the disease conditions for which marihuana may be authorized by physicians or other authorized health care providers. In addition, Health Canada will no longer be involved in:

- subsidizing marihuana for medical purposes; and
- managing the authorization process to access a legal source of marihuana and having access to confidential personal medical information.

Law enforcement will no longer be unsure about:

- whether marihuana cultivation is permitted in a residence (as all such production will be illegal).

Fire/emergency services and municipal authorities will no longer be unsure about:

- whether a residence may pose a safety threat as a result of the cultivation of marihuana for medical purposes under the MMAR, with potential fire/electrical hazard, toxic chemical hazard and mould hazard.

The purpose of the subsequent sections in this report is to present the results of the CBA conducted to assess and quantify the social benefits and costs that are likely to arise from the regulatory proposal, by inducing behavioural change that alters the level of net social benefits.

CHAPTER TWO

2.0 Stakeholder Summary

This section presents a portrait of various agents and actors in society who are likely to be affected by the proposed regulatory changes governing access to marihuana for medical purposes. In general, stakeholders affected by the public policy change fall into three broad categories: a) households or consumers; b) businesses or industry; and c) governments. The proposed regulations are expected to impact individuals and institutions in all three categories.

A. CONSUMERS & HOUSEHOLDS

2.1 Current and Future Users of Marihuana for Medical Purposes

The first category of consumer stakeholder includes those persons currently engaged with the Marihuana Medical Access Program (MMAP). These are individual Canadians who have been authorized to possess marihuana for medical purposes in response to a particular medical condition. There were 21,986 such persons as of August 13, 2012. It is important to note, however, that the number of participants in the MMAP has grown exponentially over the past ten years, with 40% year-on-year growth from 2003 to 2010, and then 60% from 2010 to 2011. This dramatic growth is crucial to understanding the needs of both the Status Quo and the Policy scenarios, as this is a consumer base that is rapidly expanding.

Of the current MMAP participants, there are four categories of supply source:

a) those who are licensed to grow their own marihuana for medical purposes (Personal Use Production License or PUPL);

b) those who have designated another individual to grow marihuana for them (Designated Person Production License, or DPPL);

c) those who purchase marihuana directly from the Government of Canada supply; and

d) those whose source of supply is unknown.

Individuals in these four categories constitute the foundation of the authorized demand for marihuana for medical purposes in Canada. This is distinct from the overall demand for marihuana, which includes the illegal use of the marihuana for recreational purposes, as well as unauthorized use of marihuana for medical purposes, both of which are beyond the scope of the regulations and this study.

Under the MMAP, the two provinces with the heaviest usage of marihuana for medical purposes per capita are British Columbia (6.7% of MMAP participants are in BC), and Nova Scotia (5.6%).

The MMAR allow access to marihuana for medical purposes for persons with the following conditions: Multiple Sclerosis; Spinal Cord Injury; Spinal Cord Disease; Cancer; AIDS/HIV Infection; Severe Arthritis; Epilepsy; and End of Life (Category 1). There is also a category for

conditions beyond the contemplated scope, where access to marihuana for medical purposes requires support from a medical specialist (Category 2).

Under the proposed regulations (Policy scenario), the current MMAP participants will become the core customer base for the new LPs. They will drive most of the demand for the LPs' products.

The proposed regulations would eliminate the PUPL and DPPL designations. As a result, all Canadians who use marihuana for medical purposes would be required to obtain their marihuana from LPs (and, possibly from pharmacists, physicians or nurse practitioners who could also be authorized to stock and sell it). The new regime would eliminate the specification of medical condition categories that are eligible for access to marihuana for medical purposes, which could potentially expand the number of legal users.

A successful policy regime would have the capacity to reach new users, provided they obtain the support of a healthcare practitioner, who are price- and risk- sensitive, and who might obtain marihuana from the illegal market as they seek relief for their symptoms. These persons might have found the current MMAR program to be difficult to deal with.

New program participants might be attracted away from the illegal market to the new regime through a combination of:

a) prices that are lower than those prevailing in the illegal market;

b) a product of higher quality;

c) a product with higher assurance of availability from LPs under legal and normal business conditions;

d) removal of legal threats and/or social stigma related to marihuana use; and

e) belief that marihuana could be used by patients with a wider variety of symptoms.

It is estimated currently that there are roughly 450,000 marihuana users in Canada who report using marihuana for medical purposes. Provided they obtain the support of a healthcare practitioner, these persons could potentially make a strong market base for LPs[1].

2.2 General Canadian Population

A change to the MMAR will also have an impact on the general population of Canada – i.e., persons who do not use or purchase marihuana for medical purposes. Despite not being active participants (or consumers) of marihuana for medical purposes, the general population is nevertheless affected by marihuana production and consumption in two important respects.

[1] The Canadian Alcohol and Drug Use Monitoring Survey (CADUMS) for 2011, administered by Jolicoeur et Associé for Health Canada, identified that 1.6% of Canadians aged 15 years and over reported using marihuana in the past

Firstly, there is extensive evidence (elaborated further in the Literature Review and other sections of this report) that residential production of marihuana raises public safety concerns. These include increased risk of fire, exposure to toxic chemicals and mould, and potential ground water contamination from improper waste disposal. Secondly, according to law enforcement officials, residential production of a controlled substance tends to produce adverse public security issues – increased risk of burglary, home invasion, criminals convening in areas where they believe marihuana is being grown, and potential violence against individuals who are carrying marihuana.

The MMAR impact on the general Canadian population has been documented by law enforcement, and is largely due to the misuse of PUPLs and DPPLs as de facto "grow ops" under the legal cover of a MMAR production license. In the Policy scenario, all non-LP production of marihuana becomes illegal by definition, making any non-LP "grow ops" illegal and, therefore, no longer an unintentional by-product of the MMAR.

B. INDUSTRY, BUSINESS & MEDICAL SERVICES

2.3 Physicians/Medical Community

There are 69,700 licensed physicians in Canada (2011 Census), which is a ratio of 203 physicians per 100,000 Canadians. This number is divided between 35,350 family medicine practitioners, and 34,350 specialist physicians. Under both the existing MMAR and the proposed Policy scenarios, physicians play a key role in supporting an individual's access to marihuana for medical purposes. As with the treatment of all symptoms and conditions, they are responsible for assessing and evaluating their patients' medical needs to determine the most appropriate and effective treatment.

Under the MMAR, the paperwork required to support the patient's application for authorization to access marihuana for medical purposes has been characterized by physicians as onerous. If the patient's medical condition is not covered under the nine recognized conditions listed (i.e., Category 1), the MMAR require patients to seek advice from a specialist to support the patient's application as appropriate in light of their symptoms and overall treatment plan.

Physician willingness to support the use of marihuana for medical purposes varies considerably from province to province, with British Columbia and Nova Scotia having the highest rate of support. Under the MMAR, physicians bear a time cost to support program administration in filling out the necessary paperwork to support patient authorization for the use of marihuana for medical purposes.

Under the proposed Policy scenario, the need to recommend a specialist will be eliminated, as there is no category of allowable conditions. Furthermore, the document required to be completed by physicians is anticipated to be much less complex and time-consuming to complete.

In addition to physicians, it is anticipated that other health care practitioners (e.g., nurse practitioners) will also be able to support the access to marihuana for medical purposes, if authorized by their provincial regulatory authorities.

Health Canada will no longer play a role in authorizing user access to the regime, although it will continue to support health care providers through the support and review of scientific investigation of the health effects of using marihuana for medical purposes.

2.4 Pharmacists

There are 30,550 pharmacists in Canada (2011 Census). Pharmacists are regulated health care professionals who assist their patients with access to, and information regarding, pharmaceutical products and medical therapies to safely achieve health outcomes at home, in the community and in hospitals. The current MMAR allow for pharmacists to dispense marihuana that has been produced by a licensed dealer under contract with Her Majesty in right of Canada to the holder of an authorization to possess. This provision was added in 2005 when some provinces and territories expressed an interest in allowing pharmacists to undertake this activity. While it is permitted under the current MMAR, dispensing of marihuana for medical purposes by pharmacists has never been done to date.

In the proposed Policy scenario, pharmacists would be able to distribute dried marihuana, as supplied to them by LPs, provided that this is permitted under provincial/territorial law.

By adding an additional class of product to their operations, pharmacies could stand to increase their revenues. Pharmacies already must adhere to stringent security requirements because of the controlled substances in their inventories. It is possible that they may incur increased costs in terms of complying with new regulations with respect to security requirements and potential risks of increased criminal activity (e.g., burglary) due to the presence of a substance with strong black market demand. The potential role of pharmacists in supporting access to marihuana for medical purposes is still undecided.

2.5 Licensed Producers (LP) of Marihuana for Medical Purposes

Under the proposed regulations, the Government of Canada will license commercial producers (individuals and/or incorporated businesses) to produce and distribute dried marihuana for medical purposes. These licensed producers (LPs) will be responsible for growing cannabis, storage of dried marihuana, security requirements, regular reporting about product quality and adherence to various regulations and distribution to eligible consumers. Over 100 companies have indicated an interest in applying for an LP license and participating in this regulated market. However, considerably fewer are expected to meet the minimum standards established by the new regulations.

In summary, under the proposed regulatory process:

- Consumers will consult their physician (or other authorized health care provider), who will assess their condition and determine if marihuana for medical purposes is an appropriate component of a treatment plan;
- The physician/health care provider will fill out a short medical document with standardized content;
- The patient can then choose from which LP they would like to obtain their legal supply of dried marihuana, in the authorized amount and via courier delivery;

- LPs will have flexibility in terms of their business operations. They will not be restricted in the number and type of cannabis strains they supply. They will have flexibility in product pricing and regarding the scale of their operations (subject to inspection and to the approved production volume associated with a specific facility). However, they will not be able to operate "storefront" sales locations, and their marketing and promotional activities will be limited as a result of marihuana's status as a controlled substance. All marihuana will be distributed in dried form. All LPs must provide standardized packaging and labelling for their product, and ensure its safe and secure distribution (with signatures required at all transition points during delivery).

LP start-up costs will be significant in the short term, as they are required to obtain a license, to establish a secure indoor growing area, to provide sufficient manpower and infrastructure to grow crops, to prepare operations for mandatory inspections by Government of Canada and to provide regular reporting to the Health Canada's Office of Controlled Substances (OCS). LPs will pay for their supply of seeds, production supplies (e.g., water, electricity, equipment, packaging materials, etc.) and provision of a secure delivery system.

LPs will benefit from the opportunity to participate in the new industry of providing marihuana for medical purposes directly to eligible consumers. They will be free to compete within the bounds of the regulations and grow their client base. Projecting the size, number, productive capacity and viability of LP is the crux of the Policy case and is a matter of particular focus in the analysis.

C. GOVERNMENTS

2.6 Municipal Governments

There are 5,600 municipalities in Canada of varying sizes and socio-demographic composition. These municipal governments will be impacted by the proposed regulations in two key respects. First, they currently shoulder the burden of the majority of the public safety and security costs identified above (e.g., fires, burglary) as the responsible agencies (e.g. fire department, police service) are generally funded municipally. Under the current MMAR, municipal governments have consistently highlighted the dangers of residential production of marihuana.

Second, municipal governments would potentially be involved in the business regulation of LPs, through land-use zoning, business permitting and by-law inspection of LP facilities. Municipalities will generally require that LPs be registered as a business entity and pay for municipal services like any other business. It is possible that LP production facilities and places of business may require a greater response from municipal agencies and first responders if they become the undue target of crime. Commercial indoor marihuana production by LPs may also impact on municipal land-use or environmental by-laws where applicable.

Municipal governments are also responsible for the fire departments that must respond to the increased risk of fire from residential indoor marihuana cultivation. While all forms of residential marihuana cultivation likely involves a higher fire risk than the baseline (i.e., for all family residences), the evidence from fire services data is that the risk of fire resulting from electrical wiring/equipment and risks related to faulty installation or construction are likely to be much higher when the legal scale of approved marihuana cultivation is exceeded and the MMAR production activity is misused.

2.7 Law Enforcement Agencies

Law enforcement in Canada is handled in three tiers – Federal, Provincial/Territorial, and Municipal. There are 64,150 police officers in Canada or roughly 206 police officers per 100,000 Canadians. There are two likely impacts of the existing and proposed regulations on this group. First, under the current MMAR, law enforcement has reported incidents of robbery and, more rarely, violence towards households or individuals growing marihuana under a DPPL or PUPL. These are typically handled by municipal police forces.

Second, law enforcement has also reported cases of alleged misuse of the DPPL or PUPL by criminal elements. These cases of misuse may be investigated by some combination of municipal and/or provincial police service (depending on the level of illegal activity). Law enforcement agencies have documented almost 200 alleged cases of abuse of the MMAR over a six year period from 2003-10 which, when accounting for the likelihood of detection, might support an estimate that 35% of DPPL and PUPL production involves some degree of misuse and diversion of marihuana intended for personal medical use to the illicit market.

Of special note are the issues noted by law enforcement officers when investigating alleged misuse (e.g., growing more than licensed, diverting marihuana supply to the illegal market) in connection with a DPPL or PUPL. In such cases, evidence over and above the mere existence of residential cultivation will likely be required to obtain a search warrant. This increases the cost of investigating marihuana violations to law enforcement, as more resources must be dedicated to investigation and evidence collection. Under the Policy scenario, this becomes irrelevant, since all residential production becomes illegal.

2.8 Provincial/Territorial Governments

The ten provinces and three territories are currently indirect participants in the MMAP. Under the existing program, they have no role in approving authorizations to possess and use marihuana for medical purposes. Currently, dried marihuana is not covered by any provincial or territorial health/drug plan as an approved treatment for which there is co-insurance related to the purchase of medication.

Under the Policy scenario, the role of provinces and territories would change. LPs would be subject to standard provincial/territorial oversight or regulations that are typical for a business of their size and context (e.g., environmental regulations) but would also derive tax revenue from them in terms of: a) corporate income tax; and b) HST or provincial sales tax on the sale of marihuana for medical purposes.

In addition, provinces/territories may face pressure to include coverage for marihuana for medical purposes under their respective health/drug plans. They may also, in their discretion, expand the range of health care professionals who could authorize the use of marihuana for medical purposes (e.g., nurse practitioners) and may also allow pharmacies to distribute to authorized users.

2.9 Federal Government

The Government of Canada administers the existing MMAP. Under the MMAP, the Government of Canada faces three main cost pressures.

First, it has engaged a Government Supplier under contract – Prairie Plant Systems (PPS) – to provide marihuana for medical purposes to authorized users. This contract was the result of an open competition in 2000, followed by subsequent amendments. PPS produces a contracted amount of dried marihuana, which is distributed to individuals at a price of $5.00 per gram. The size of the MMAP has grown exponentially over the past ten years resulting in amendments to the contract with PPS to provide an adequate legal supply.

Second, Health Canada is responsible for administration of the MMAP. Individual Canadians fill out forms and apply for an authorization to possess and use marihuana for medical purposes (ATP). In addition, the Government of Canada bears the administrative costs of processing applications for PUPLs and DPPLs. As of August 13, 2012 there were 21,986 ATP persons under MMAP, and this number is expected to continue to rise to 40,000 ATPs by 2014. Processing and monitoring active ATPs requires system and human resource support.

Third, the Government of Canada is subject to ongoing litigation with respect to the MMAR.

The contract with PPS will expire at the end of March 31st, 2014. This will generate cost savings related to the effective subsidy (i.e., the difference between the actual supply cost and the price paid by users). Program administration costs will diminish, as rather than processing and licensing individual applicants, the Government of Canada will only deal with the licensing and inspection related to a small number of LPs. These LPs will be subject to regulatory oversight, including security and quality inspections, as well as regular reporting and business license extensions. LPs would also be subject to corporate income tax.

Under the MMAP, the licensing and administration of ATPs is handled by a dedicated team within Health Canada, along with the management of the contract with the Government Supplier. In the Policy scenario, licensing and administration related to LPs will be incorporated into the operations of the Office of Controlled Substances.

CHAPTER THREE

3.0 Literature Review Summary

The fundamental challenge of this CBA is to articulate and substantiate a Reference case that corresponds to the way the future will likely unfold under the proposed regulations. There are no similar regulations elsewhere in the world, so there is limited opportunity to learn from the experience of others. The analysis is predicated on the founding and growth of a new marihuana for medical purposes industry that does not currently exist and that will operate under a unique set of regulatory requirements and market conditions. There is significant inherent uncertainty related to how users and the producers in this new industry will behave, for which we look to evidence in the literature in several fields for guidance.

For clarity, the literature consulted and cited has been broken into four categories:

1) Cannabis/Marihuana Use and Trafficking: While there is no direct comparison to the proposed Canadian system, other jurisdictions (notably California, Israel and the Netherlands) have developed regulatory regimes for the use of marihuana for medical purposes, which can, to some extent, be used as reference points. Additionally, there are studies of Canada's existing MMAP, including internal data from Health Canada, which can assist in an understanding of the nature of the existing Canadian market for marihuana for medical purposes.

2) Crime Prevention and Public Safety: A principal criticism of the existing regime is that it results in misuse of personal and designated production licenses to divert marihuana to the illegal market. These activities have been examined by Canadian law enforcement authorities and other sources.

3) Regulatory Compliance Theory: Any new regulatory regime must consider the immediate, short-term and long-term impacts of regulation. In this specific scenario, the government must establish a regulatory structure that empowers and enables a new industry to be created in a short 'ramp-up' period to ensure that those who require marihuana for medical purposes can access a legal supply. The regulatory regime should encourage and cultivate a competitive market, allowing purchasers of marihuana for medical purposes to enjoy the benefits of an industry that competes on the merits of price, quality and other product attributes. The regulatory regime must be secure and sustainable, without undue regulatory burden. It must also consider the compliance of existing stakeholders, particularly those who are currently engaged in the MMAP. How existing "Personal-Use" and "Designated" Producers will interact with the new regime is crucial, and compliance theory literature is reviewed to investigate the likely outcomes.

4) System Dynamics Theory: One methodology used to support this CBA is System Dynamics – a mathematical modeling discipline which focuses on modeling the causal relationships in complex social, economic, and environmental systems. System Dynamics, unlike much economic modeling, assumes that systems are rarely in equilibrium and that unforeseen consequences of policy changes and non-linear changes in outcomes can often occur due to the complex feedback relationships that

exist in real-life systems. The System Dynamics literature is reviewed in the following analysis, where relevant.

3.1 Cannabis/Marihuana Usage and Trafficking

A series of reports from consultations with multiple stakeholders, conducted by Health Canada in regards to the MMAP, was analyzed. This included feedback from doctors, government officials, law enforcement, compassion clubs and individual Canadians, often with personal stories of their use of marihuana for medical purposes and experience with the existing regulatory regime. This review provided a framework to understand the current regime and its challenges, and to identify further resources to pursue.

Existing personal-use growers, designated growers and participants in the current MMAP were largely opposed to the new regulatory proposals. A minority of participants, largely those who were not growing or who had found a designate, had mixed response to the new regime. However, the comments of some participants and other stakeholders, when combined with inferences from the literature, suggest that these groups could benefit from the proposed regulations via: (i) easier access to marihuana for medical purposes, which would lead to lower information and other transaction costs, as well as shorter delays; and (ii) greater product choice and "freedom of choice" from a regulated industry that, in time, would be producing a product of higher and more predictable and reliable quality.

A review of studies [Dandurand et al (2002), Easton (2004), Jaworski (2009), Lucas (2009), Patton-Bodnarchuk (2004), Plecas et al (2005), Tjepkema (2004)] identified key trends in Canadian marihuana use and trafficking.

A review of studies [Ben Amar (2006), Hazekamp (2006), Health Canada (2010b), Seamon (2007) Williams-Skeel (2006)] of the medical perspective on the use of cannabis for medical purposes was also assessed There is some clinical evidence to suggest modest therapeutic benefits of smoked or vaporized cannabis for a limited number of medical conditions but the clinical trials have generally been of very short duration, and have used a small number of patients, many of whom were already experienced with cannabis.

Health Canada's published information for health care practitioners (Health Canada, 2010b) indicates that:

a. Precise dosages for cannabis have not been established. The complex pharmacology of cannabinoids, inter-individual differences in cannabinoid bioavailability, prior exposure to and experience with cannabis, the variable potency of the plant material, and different dosing regimens used in different research studies all contribute to the difficulty in reporting precise doses or establishing uniform dosing schedules;

b. While there are many anecdotal reports concerning the therapeutic value of cannabis, clinical studies supporting the safety and efficacy of smoked cannabis for therapeutic purposes in a variety of disorders are limited but slowly increasing in number and;

c. The risk/benefit ratio of marihuana should be carefully evaluated in patients with the following medical conditions (because of individual variation in response and tolerance to its effects, as well as the difficulty in dosing):

i. patients with cardiac disorders (i.e., concerns re: hypotension, possible hypertension, syncope, tachycardia, or myocardial infarction);

ii. patients with respiratory insufficiency such as asthma or chronic obstructive pulmonary disease (concern re: smoked marihuana);

iii. patients with a history of substance abuse including alcohol abuse (concerns re: risk to abuse marihuana and risks regarding developing dependencies);

iv. patients with mania, depression, or schizophrenia who should be under careful psychiatric monitoring (concern re: exacerbation of such illnesses);

v. patients receiving concomitant therapy with sedatives, hypnotics or other psychoactive drugs such as opioids (concern re: additive or synergistic effects on the central nervous system);

vi. patients should be advised of the negative effects on memory and to report any mental or behavioural changes that occur after using marihuana; and

vii. patients with ongoing chronic hepatitis-C should be strongly advised to abstain from daily cannabis use (concern re: marihuana use as a predictor of steatosis severity in these individuals, i.e., worsening of the disease).

This medical assessment and overall concern regarding marihuana's use as a 'treatment' was supported by the feedback from the Canadian medical community during the Health Canada consultations [CMA (2011)] and the "needs assessment" conducted with family doctors at the College of Family Physicians of Canada (CFPC) Family Medicine Forum in Montréal in November 2011. Key concerns cited by medical professionals and practitioners were:

Lack of scientific evidence, information and guidance available to the ordinary physician on the risks and benefits of marihuana for medical purposes;

Lack of established/regulated standards and clinical practice guidelines on prescribing practices for marihuana for medical purposes;

Medical support has too much similarity with typical prescriptions under the new regime (which is seen as a negative feature by the medical community and a positive feature by many other stakeholders);

Lack of guidance on 'prescribed dosage' and 'period of treatment time', and the potential impact on medical legal liability;

The risk of "over-prescribing" marihuana, particularly given the absence of clinical practice guidelines for its usage. This risk creates additional costs and burdens for physicians because they need to conduct additional oversight and monitoring;

Pressure on physicians who are the sole practitioners in their communities to support the use of marihuana for medical purposes despite their discomfort on medical grounds; and

Lack of research and/or a clinical trial component in the reform proposal.

A wide body of literature on the economic considerations of marihuana use and trafficking has been considered in the context of the broader policy of marihuana legalization. Much of these economic considerations are also valid within the context of this more focused assessment of the regulatory change and the use of marihuana for medical purposes. This CBA does not address the larger policy issue related to marihuana legalization. Key studies [Becker et al (2006), Bretteville-Jensen-Line (2006), Godfrey et al (2002), Kilmer et al (2010), Kilmer-Pacula

(2009), McDonald et al (2005), Pacula et al (2003), Rhodes et al (2000), Single (1998)] suggest that economic regulation, rather than prohibition, of access to marihuana for medical purposes would generate economic benefits that far outweighed the costs associated with pursuing and prosecuting low-level crime like marihuana dealing.

Key considerations for potential LPs, which are relevant for assessing the impact of the proposed regulation, include:

The cost of applying for and receiving a license and approvals from local governments;

The full cost of investment, including: financing costs; information and transactions costs (which can be significant for a new industry); costs of establishing the distribution system and relationships with suppliers; costs of attracting, hiring and training the work force; and the costs of meeting the safety, security, quality, record-keeping and other regulatory costs (many of which are 'sunk costs' that may be difficult to recover in the event of company, industry and/or regulatory failure);

The cost of operation, including: costs of labour and intermediate inputs (goods and services) from suppliers' on-the job training; ongoing regulatory compliance; and providing reliable information on their products to doctors, Health Canada and other stakeholders;

The cost of adapting to and complying with new regulatory requirements after start-up; and

Any regulatory constraints on advertising and marketing.

3.2 Crime Prevention and Public Safety

Crime prevention studies [Bowles (2010), Cohen (1998, 2010), Cohen et al (2004), Dhiri-Brand (1999), Reppetto (1976), Roman (2010)] have shown that any attribution of benefits to government law enforcement must take into account the 'displacement effect' of crime reduction on shifting (rather than diminishing) criminal activity. This literature has also developed willingness-to-pay or economic costs of criminal activities.

An economically-rational deterrence effect on illicit drug activity was developed [Chang et al (2008)] using a calibrated general equilibrium model result for the United States (US) to determine optimal drug policy for a low-income neighbourhood. This model analyzed the consequence of both demand-side and supply-side drug policies and compared welfare gains through calibrated simulation analysis in a manner similar to a general-equilibrium tax incidence model.

Effectively, drug trafficking was treated as an occupational choice with employment and drug transactions modelled in a search-theoretic manner. The drug market equilibrium was established through supply/demand interaction and the entry of drug dealers continued until expected (risk-adjusted) pure profit was eliminated. The extent to which community members opted for a career in the drug market determined the supply of drugs by the community.

This model and its results were considered relevant to this study as it was the only empirical model in the literature that provided a behavioural response of drug trafficking to changes in the probability of conviction. The calibrated simulation results indicated that a 10% increase in the

probability of criminal conviction for drug trafficking or production would decrease the number of active dealers by 0.26%.

Additionally, a consortium of twenty (20) law enforcement agencies [RCMP (2010)] (representing services to perhaps more than 75% of the Canadian population) reviewed 190 cases over a six to seven year period in which police made an investigation of a residence for which a person held a valid MMAR production license (PUPL, DPPL)[2].

A review of alleged 'misuse' cases (Figure 4.7 below) showed that the number of such alleged misuse cases as a proportion of MMAR authorizations to possess varied from 1.5-3.0% over 2005-2010. However, there is a low estimated rate of police detection for illegal marihuana cultivation (i.e. grow operation). One British Columbia (BC) study estimated this rate at 5% [Dandurand et al (2002)] while another study estimated the rate for Quebec at 2.5% [Bouchard (2007)]. If a higher (10%) rate of detection is assumed, this implies that the estimated rate of MMAP 'misuse' could be in the range of 15-30%. The lower rate of 5% detection would imply an estimated rate of MMAP 'misuse' in the range of 30-60%.

Health Canada regulatory analysis dealing with cigarette ignition propensity [Health Canada (2005)] used fire statistics from the Canadian Association of Fire Chiefs Annual Report – Fire Losses in Canada for various years to estimate probabilities of fires. The analysis followed this approach using available average Canadian data for a five year period (1998-2002) that involves the most recent data available.

3.3 Regulatory Compliance Theory

The theory of regulatory compliance was assessed to better understand how the proposed regulations might impact the behaviour of persons already accessing marihuana under the MMAR and persons who always have an option to access marihuana for medical purposes from the illegal market. In particular, this study explored what evidence exists to help anticipate the expected regulatory compliance of Canadians under the proposed new regulatory regime. The success or failure of the new LP industry is predicated in the assumption that, as in other regulatory regimes, the new regulations will be enforced such that the requirements are obeyed by persons subject to the regulations.

Key insights were derived for three key issues relevant to the transition between the existing and new regulatory regimes of accessing a legal supply of marihuana for medical purposes:

1) Monitoring regulatory performance and the behavioural response of agents following regulatory change;

2) Impact of regulatory change on compliance performance and market dynamics; and

3) Impact of inspection on compliance motivation and relationship between the regulatory authority and the affected population.

[2] RCMP (2010) *An Analysis of National Cases Related to the Marihuana Medical Access Regulations.* The law enforcement agencies including RCMP, OPP, SQ and municipal police in Toronto, Montreal, Vancouver, Ottawa, Calgary, Edmonton etc.

A) Monitoring Regulatory Performance

Existing regulators taking on new and unfamiliar responsibilities typically encounter limitations in their ability to measure and report on performance [Sparrow (2000, 2008)]. Although the proposed regulations are patterned on the existing regulatory regime for controlled substances, the performance management and reporting by Health Canada will likely be based on the following:

> Presumed relationships between inputs, outputs, intermediate outcomes and final policy outcomes from the logic model and "theory of the regulation";
>
> Qualitative and anecdotal information and complaints from the media, competitors, business customers, civil society groups and other affected and interest groups on the determinants of compliance and other indicators of outcomes and results; and
>
> Improvements to compliance and other outcomes resulting from projects that mitigate a specific regulatory problem, risk or harm, and which are selected because of their ability (based on the theory and logic model) to contribute to the higher level outcomes and objectives of the regulatory regime.

In the context of the uncertainty of establishing a new and commercially viable LP industry to supply a legal source of marihuana for medical purposes, Health Canada will need to closely monitor the performance of LPs as they ramp up to full production. This may be challenging in terms of accessing information beyond what is required to meet regulatory requirements.

B) Impact of Regulatory Change

The proposed regulations make fundamental changes to the marihuana for medical purposes supply industry. Generally, regulatory change results in the expansion or contraction of regulations affecting an existing stakeholder group. However, the proposed regulatory regime for marihuana for medical purposes will fundamentally change who is being regulated. As this is an uncommon occurrence, the literature was investigated to determine the likely results of a fundamental shift in the focus of government regulation, in particular, how Health Canada's focus (away from licensing of individuals and towards licensing commercial producers) will change the incentives and behaviour of individuals.

Changes in regulatory scope and reach (i.e., the affected population and their attitudes) could have either a positive or negative influence on compliance and other intermediate and final outcomes [May-Koski (2004)]. These outcomes will depend on:

(i) The affected population's experience, resources and interest in complying with the regulation;

(ii) Structural change and (possible) market concentration in the industry, which could either improve compliance (i.e., fewer firms are easier to regulate) or make compliance more problematic (i.e., larger and more powerful firms can increase political lobbying and regulatory capture, and lead to the "too-big-to-fail" erosion of enforcement);

(iii) Changes in political, voter and consumer interest and media attention can change regulatory compliance and performance over time [Sparrow (2000, 2009)];

(iv) Changes in a regulated market's growth and profitability can result in competitive turbulence and greater compliance variation, especially during market downturns when cost cutting pressure can reduce compliance resources; and

(v) Rapid market growth and entry of new regulated firms can also place pressure on the regulatory authority's inspection and enforcement during times when investment and market pressures are focused on increased production, perhaps to the point where the firms may cut corners in complying with regulations.

C) Impact of Inspection

The establishment of a new LP market under the proposed regulations requires a series of inspections, particularly at the start-up phase of the new businesses. Regulatory compliance theory [May-Koski (2004)] highlights the importance of the relationship between inspectors and regulated industry managers which may create positive and negative motivations and trade-offs between the two. For example, inspectors that are collegial, respectful, less formalistic and provide good information on the requirements of the regulation can increase positive motivations through shared information, learning, "mental models", problem solving and a "social contract" between the regulator and affected population. Such an approach also reduces negative motivations through increasing transparency, demystifying the regulation and its enforcement and compliance programs, and reducing the fear, risk and uncertainty that promote negative motivations towards compliance.

3.4 System Dynamics

Marihuana use results from a complex set of relationships and interactions between markets and stakeholders (e.g., governments, users, doctors, law enforcement authorities, suppliers). A System Dynamics approach [Sterman (2000), Morecroft (2007)] captures the inter-relationships between these system elements and enables the analysis of causal loops that affect the behaviour of the overall system.

System Dynamics (as opposed to Systems Thinking) requires "causally-closed" models [Richardson (1991)], as the causes of the behaviour exhibited by the system must be found endogenously – within the structure of the system model itself. While there will be external inputs and outputs which have an impact on the magnitude of the system's operations, the causal relationships which create that behaviour must be entrenched within the system itself.

The CBA benefited from a System Dynamics model of individual and firm behaviour over time for the regulated marihuana for medical purposes supply industry. This model involved: LPs, production capacity, strategic resources, market processes, production processes, pricing impacts, projected growth, projected users etc.

The System Dynamics model was based heavily on various studies related to modeling and the conceptualization process [Forrester (1961), Randers (1980), Vennix et al (1992), Hodgson (1992), Saeed (1992), Richardson et al (1992), Winch (1993)] which include examples of the process and structure of developing an industry model, including how consumers gain awareness of products, the development of supply, marketing, distribution, and consumer usage patterns.

Specific studies that were relevant to regulatory compliance and legal/illegal market dynamics included:

a) Homer (1993, 1997), which developed a 'War on Drugs' model to understand cocaine prevalence trends and policy impacts. The model captured the cocaine market mechanism including supply, demand, price, and market actors as well as how the criminal justice system interacts with the illicit market;

b) Lyneis (1999, 2000), which developed a detailed, calibrated model to support the development of business strategies. It focused on market share and resource allocation between competing companies and assessed cost-benefit tradeoffs of business strategies. Lyneis (2000) also explained the causes for market behaviours and illustrated that System Dynamics models can "provide more reliable forecasts than statistical (non-structural models);

c) Cavana-Clifford (2006), which tested the causality between tobacco import behaviour and government policy options in New Zealand;

d) Dudley (2004), which examined the inter-relationships between demand, price and forecast stock and log availability, log harvesting capacity, log exports and the impact of an export ban on Papua New Guinea;

e) Delsys Research Group (2012), which developed a qualitative system dynamics model depicting the "theory of the business" for the new consumer product safety regulatory regime at Health Canada; and

f) Tawileh et al (2009), which developed a model of alcohol misuse, which touched on many of the same issues as marihuana use for medical purposes, including law enforcement and doctor/patient relations.

Specific studies that were relevant to business and user dynamics included:

g) Sterman (2000), which modeled commodity cycles and examined how price functions to balance supply and demand, and examined the business supply chain mechanism and how business adjusts capacity to meet orders and demand; and

h) Delsys Research Group (2004), which developed a strategic 'business flight simulator' for First Nations Statistical Institute. This business-planning tool modeled inter-relationships between market demand for statistical services, production, human resources and financing.

Specific studies that were relevant to licensing, compliance and law enforcement issues included:

i) Delsys Research Group (2008), which mapped broadcasting and telecom licensing processes and tracked information flows into and through the process. The model included unavoidable re-work cycles and tested how to sustain organizational capacity to meet performance requirements;

j) Morecroft (2007), which focused on drug-related crimes and modeled inter-connections between drug users, street market, police and the community; and

k) Delsys Research Group (2005), which developed simulation models to support strategies for combating mass-marketing fraud, including: entry, exit, marketing activity investment, ROI, and sales success rates (i.e., victim responsiveness). The models tested different compliance strategies, including law enforcement activities and related deterrent effects.

Other literature that was specific to identification of variables and parameters required in the CBA model is cited in the Methodology section.

CHAPTER FOUR

4.0 CBA - Methodology

This section describes in detail the methodology used in the Cost Benefit Model to estimate the Status Quo and Policy scenarios over the forecast period and the Net Present Value difference between them for monetized benefits and costs.

This section is divided into sub-sections that describe the following components:

1. Persons Accessing A Legal Supply of Marihuana for Medical Purposes;
2. Status Quo – Program Administration Costs;
3. Status Quo – User Benefits & Costs;
4. Status Quo – Safety Costs;
5. Status Quo – Security Costs;
6. Status Quo – Summary of Benefits & Costs;
7. Policy – Transition Model (April 2014);
8. Policy – Demand Curve;
9. Policy – Supply Curve;
10. Policy – LP Market Equilibrium;
11. Policy – User Benefits & Costs;
12. Policy – Safety Costs;
13. Policy – Security Costs;
14. Policy – Program Administration Costs;
15. Policy – Summary of Benefits & Costs; and
16. Net Present Value (Policy vs. Status Quo)

The methodology description will address each of these components separately.

It is important to note that the CBA focuses on the consumption of marihuana obtained from legal sources of supply for medical purposes. The broader issues of illicit market supply and use (except the potential misuse of residential production licenses under the MMAR and in the Policy scenario) are outside the scope of the study.

4.1 Persons Accessing a Legal Supply of Marihuana for Medical Purposes

The CBA study estimates a pool of potential persons who, over time, would be interested in accessing a legal source of marihuana for medical purposes. This was used to estimate the time path of authorized marihuana users in the Status Quo scenario. Following the development of a Transition Model, this pool of potentially eligible marihuana users was also used to estimate the path of legal users in the Policy scenario.

4.1.1 Future Growth & Likely Upper Bound

Health Canada data on persons with Authorization-to-Possess (ATP) status were available for the month of January values from 2003 to 2012 (Figure 1.1 above). This data showed exponential program growth of over 40% per year since 2006.

It is difficult to confidently assume that such exponential growth can continue for another ten years, as there is good reason to believe that there is a natural ceiling towards which the level would approach (or a steady- state growth path that is much lower than 40% per year).

Assuming that exponential growth of 40% per year continues for the 12-year forecast horizon from 2012 to 2024, this would effectively project an ATP level of about 690,000 persons in 2024.

The Canadian Alcohol and Drug Use Monitoring Survey (CADUMS) for 2011, administered by Jolicoeur et Associé for Health Canada, identified that 1.6% of Canadians (aged 15 years and over) reported using marihuana, hashish, hash oil, or other cannabis derivatives in the past year for medical purposes. This would suggest that there were 420,000 persons in 2011 who may use marihuana for medical purposes. Of these persons, about half reported that their medical reason for cannabis use was related to a chronic pain condition, while the other half reported use related to nausea or vomiting, lack of appetite or weight loss, depression, multiple sclerosis or spinal cord injury, epilepsy, anxiety or nerves, glaucoma, insomnia and other unspecified reasons.

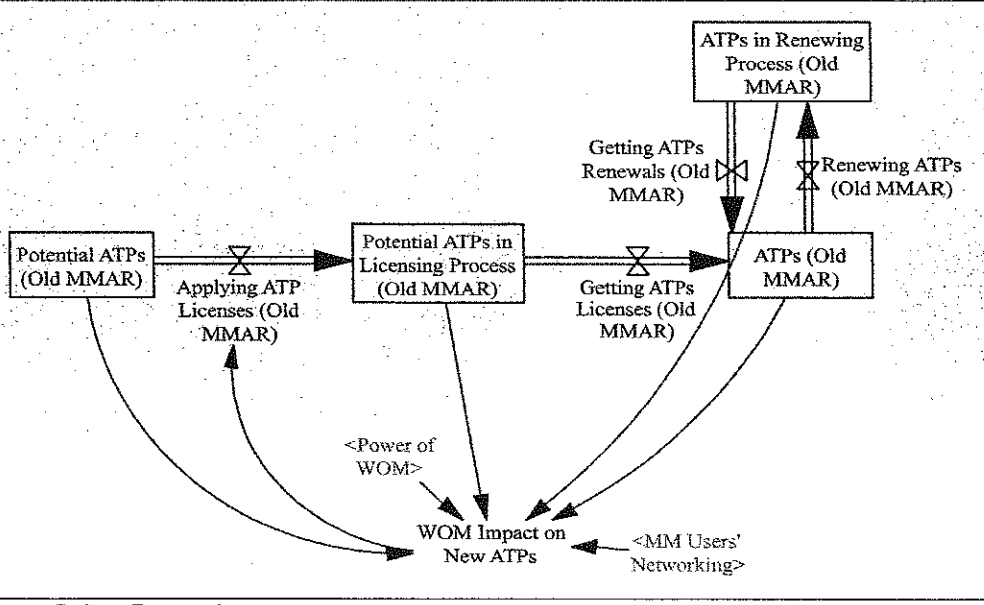
For the purpose of modelling the future growth of the MMAP (in the Status Quo scenario) over the forecast period from 2014-15 to 2023-24, the analysis used an upper bound (or ceiling) of 450,000 Canadians who might become participants in the MMAP as the Reference case. In order to provide a sensitivity analysis, the range of upper limit was assessed from 250,000 to 650,000 persons participating in the MMAP.

A System Dynamics model[3] of program uptake was developed to track the growth of the program (to 2012) and to forecast program uptake to 2025. This continuous simulation model used differential equations to calculate variable changes over time. Figure 4.1 shows a

[3] System Dynamics simulation models map the causal relationships that determine the behaviour of complex systems and use differential equations to account for dynamic changes in stocks (accumulations) and flow processes over time. These models can be calibrated to replicate known data and can be used to rigorously assess how complex interaction and feedback processes in economic, environmental and social systems influence behaviour over time. They can help identify potential unanticipated consequences of policy proposals in both public and private sector contexts. Systems Dynamic models were used to inform the CBA with respect to the growth of MMAP usage both with and without resource constraints under the Status Quo scenario, as well as the transition process between the Status Quo and Policy scenarios. These models also informed other aspects of the regulatory change process.

simplified model structure in which potential ATP persons move through a process to become aware of, and apply for, access to the existing MMAP regime.

Figure 4.1 – Status Quo – System Dynamics Model
ATP Awareness, Application, Approval Process



Source: Delsys Research

The ATP process models the movement of potential ATP persons through the license application and renewal activities. The full model captures the complex dynamics of how Health Canada issues and renews ATPs, DPPLs and PUPLs, and provides access to the Government supply of marihuana for medical purposes.

The upper bound (ceiling) is represented by the sum of four stocks: 1) potential ATP persons; 2) persons applying for an ATP in the licensing process; 3) persons with an ATP; and 4) ATP persons involved in the renewal of their ATP, where:

Ceiling Value = Potential ATP + ATP Applications + Existing ATP + ATP Renewals

For the Reference case (i.e. deterministic case), the study assumed there are 450,000 persons who might be in need of marihuana for medical purposes (for simplicity, it is assumed that this is constant over the forecast period to 2025). As there were 4,884 ATP persons in January 2010, the majority of persons were in a 'potential pool' of persons who might want to access the MMAP regime. As the number of persons with ATP grows over time, the size of the potential pool drops.

There is no Health Canada marketing or promotion of the MMAP, even though historical growth has been about 40% per year over several years. Peer influence (i.e. 'word-of-mouth' - WOM) is assumed to be the dominant process that continues to drive MMAP growth. Such a process is often modeled in System Dynamics.

ATP Applications = Existing ATP * WOM Factor * [Potential ATP / Ceiling Value]

The resulting path of ATP persons over time is an 's'-shaped logistics curve. This curve initially tracks and continues the historical exponential path of growth before slowing and approaching the ceiling value asymptotically.

Over time, with infirmity of a growing and aging Canadian population, the effective ceiling could rise. However, it is likely that the effective ceiling on the number of ATPs would be reached before 2024 and would involve a slowing of the rate of growth to some value less than 40% per year.

The System Dynamics model produced outputs for January values which allowed calculation of monthly compound growth rates. These allowed a monthly time series to be generated so that fiscal year annual average values could be determined.

The System Dynamics growth path is expressed in terms of the percentage movement towards the asymptotic upper limit (ceiling). In order to allow for a different value for the upper limit, the CBA model used the shape-path of the percentages and adjusted these to reflect that the starting value (i.e. the value for FY2013-14) was a different percentage of the different ceiling value. This can be seen in Figure 4.2, which shows several paths for the percentage movement towards the asymptotic upper limit (for ceiling values of 250,000, 450,000 and 650,000). The shape of the paths is similar to a logistics ('s'-shaped) curve.

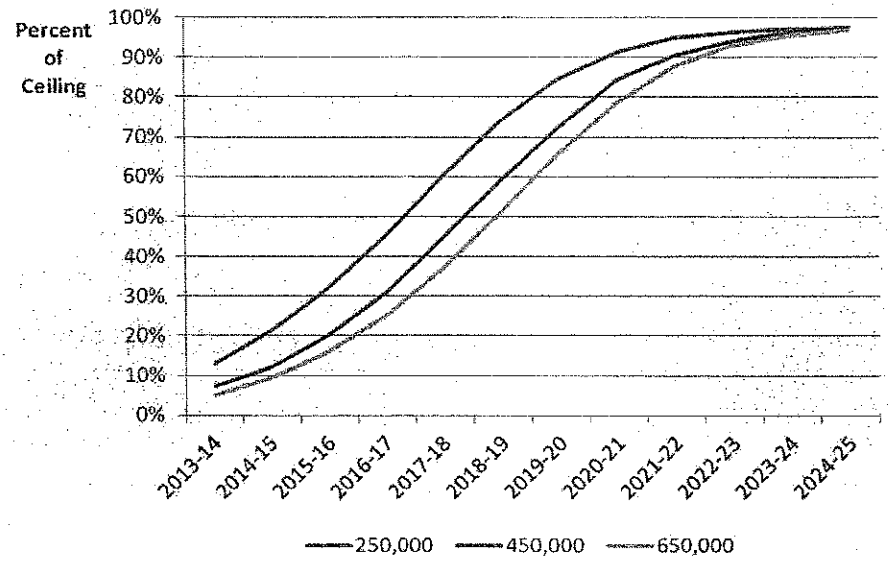
The CBA model for ATP in the Status Quo scenario is of the form[4]:

(01) ATP(t) = Upper Limit Value * % of Ceiling(t)

where the percent of ceiling at time (t) is based on the System Dynamics growth path (for a ceiling of 450,000) and adjusted for the difference in starting value. This path is determined for the aggregate number of ATP persons[5].

[4] Numbered equations focus on calculations that are embedded in the CBA Model.
[5] Effectively, the percentage increment was estimated as a polynomial of degree two relative to the lagged value of the ceiling. This produced a good fit for the System Dynamics growth path.

Figure 4.2 – Status Quo – ATP Forecast Growth Path
As % of Ceiling Value Showing Upper Limit Values



Source: Delsys Research

4.1.2 Status Quo – Composition by Supply Method

Under the MMAR, there are various supply methods that an ATP person can use to access legally produced marihuana for medical purposes:

- Access the Government Supply (these are referred to as ATP-G);
- Grow their own supply under a Personal Use Production License (PUPL) (referred to as ATP-P); or
- Arrange for their supply to be grown by a designated person under a Designated Person Production License (DPPL) (referred to as ATP-D).

For the purpose of the CBA, it is important to forecast the composition of these different types of MMAP participants. In addition to these streams of ATP users, it also turns out that a substantial proportion of persons with an ATP-G to access the Government Supply do not in fact ever place an order through Health Canada to access this supply. Therefore, as this study needed to estimate the actual usage of the Government Supply, the stream of ATP-G persons was subdivided into two types:

- Persons who do, in fact, access the Government Supply (referred to as ATP-GS); and
- Persons who do not access the Government Supply (referred to as ATP-O).

While there has been variation of time in the relative proportions of these ATP supply types, there is guidance from Health Canada that the current proportions are roughly:

- 10% ATP-GS: who access the Government Supply;

- 10% ATP-O: who access unknown supply;
- 60% ATP-P: who grow their own supply under a PUPL; and
- 20% ATP-D: who arrange for their supply to be grown under a DPPL.

The model for ATP-P in the Status Quo scenario is of the form:

(02) ATP-P(t) = ATP(t) * %share-P

where the percent share of ATP who hold PUPL is fixed over the forecast period.

The model for ATP-D in the Status Quo scenario is of the form:

(03) ATP-D(t) = ATP(t) * %share-D

where the percent share of ATP who hold DPPL is fixed over the forecast period.

The model for ATP-G in the Status Quo scenario is of the form:

(04) ATP-G(t) = ATP(t) * (1 - %share-P - %share-D)

and is calculated as a residual to be consistent with the above forecasts for ATP (total) and ATP-P and ATP-D.

The model for ATP-GS in the Status Quo scenario is of the form:

(05) ATP-GS(t) = ATP-G(t) * %share-GS

where the percent share of ATP-G who actually access the Government Supply is fixed over the forecast period.

The model for ATP-O in the Status Quo scenario is of the form:

(06) ATP-O(t) = ATP-G(t) * (1 - %share-GS)

and is calculated as a residual to be consistent with the above forecasts for ATP-G and ATP-GS.

These share parameters were assumed to be fixed over the forecast period. In order to provide sensitivity analysis, the percentage shares for ATP-P and ATP-D was varied over a range and the share of the residual ATP-G was divided between ATP-GS and ATP-O based on a percentage that also varied over a range.

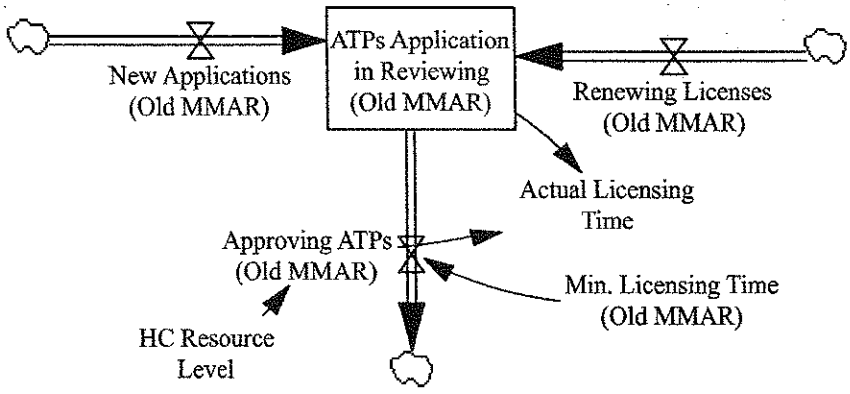
4.1.3 Future Growth and Upper Bound Under Resource Constraint Scenario

Since the MMAR were introduced, Health Canada has been faced with escalating program costs due to the increasing numbers of ATPs - over 40% in the past 7 years. MMAP costs increased from $3.7 million in 2005 to $16.7 million in 2012. A scenario in which program costs must scale resources to meet an exponential growth in demand is unsustainable for any

regulator. However, this analysis adopted a Status Quo scenario that nevertheless assumed that resources would scale as necessary to meet the demand. The reason this approach was adopted was two-fold: 1) There was no basis on which to base an assumption about what proportion of required resources the government would be willing to allocate; and 2) a scenario in which resources were not scaled would have implied the government would tolerate significant delays in issuing ATPs to users.

With a limited budget, it is inevitable that the number of ATPs will experience slower growth compared with an unlimited budget Status Quo scenario. An alternate to the Status Quo scenario was analyzed using a System Dynamics model that illustrated how a budget limitation impacts on program performance. Figure 4.3 shows the model for the MMAP licensing process, including new applications and renewal applications.

Figure 4.3 – Resource Constraint – System Dynamics Model
ATP Applications & Backlog Process



Source: Delsys Research

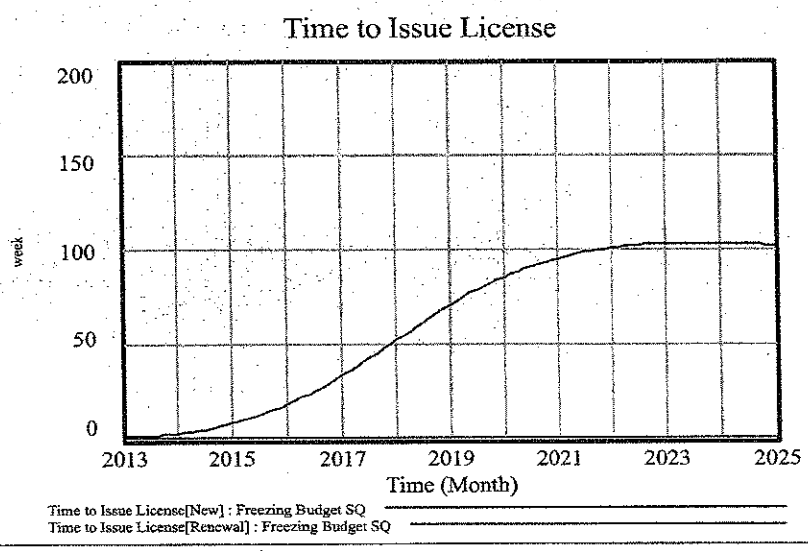
The constrained-budget scenario assumed that MMAP administration was frozen at current levels effective April 1, 2013 (estimated at $4.87 million per year). With this resource level, Health Canada forecasts that there would be 27,847 individuals authorized to possess marihuana for medical purposes by April 1, 2013[6]. In other words, this resource level would allow the MMAP to process 10,767 new applications and renew 17,080 existing licenses per year.

Figure 4.4 shows MMAP service performance relating to the time required to issue and renew ATP licenses. In the constrained-budget scenario, the average time to renew a license remained the same – approximately 0.54 weeks in the study period. This level of performance was achieved by giving greater priority to licensing renewals as opposed to issuing new licenses, a management decision designed to minimize the service gap for existing ATPs. The consequence, however, of the assumed budget freeze, coupled with the priority on renewals, was that the time to issue new licenses increased from 1 week to 102 weeks by 2025. This

[6] Health Canada forecast. As of August 13, 2012, there were 21,986 ATPs. This number is in line with the projected amount of 20,452.

result occurred because increasing program capacity was dedicated to ever-increasing license-renewal activities, and fewer resources were available for new applications.

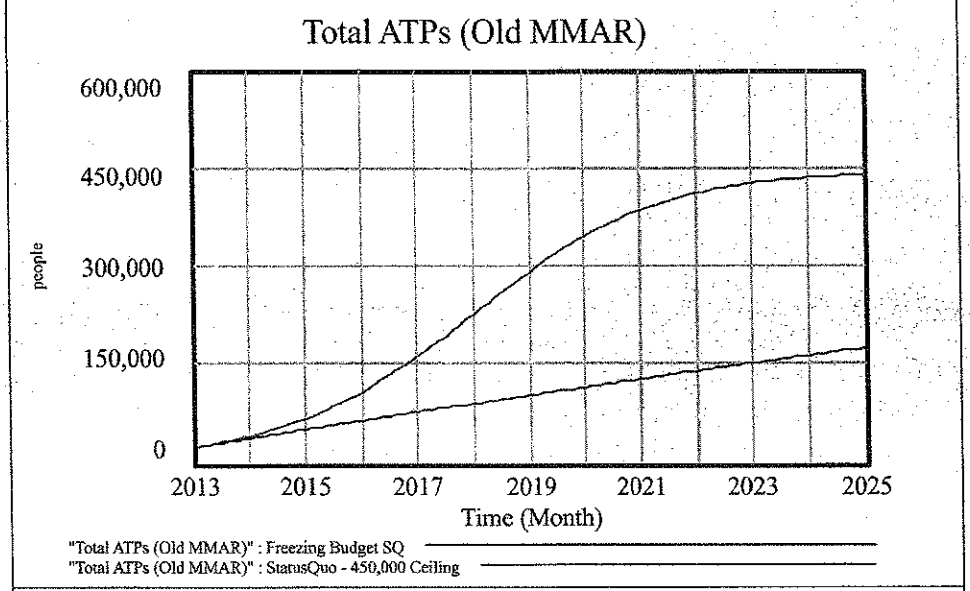
Figure 4.4 – Resource Constraint – System Dynamics Model
ATP Application Backlog (Weeks) Over Time



Source: Delsys Research

In this scenario, the System Dynamics model projected that the total number of ATPs would increase at a much slower rate compared to the unlimited resource status quo scenario, as shown in Figure 4.5, on the next page.

Figure 4.5 – Resource Constraint – System Dynamics Model
ATP Volume Over Time Showing a) No Resource Constraint and b) Effect of Resource Constraint and Backlog



Source: Delsys Research

Although the constrained-budget scenario is likely to result in practice (if the Status Quo were maintained), it was not used as the Status Quo scenario for a variety of reasons. First, there were a number of critical assumptions (e.g., the duration of the budget freeze, the decision on funding levels, alternate assumptions regarding program resource allocations) that change the results of the scenario for which there was no evidentiary basis. Second, to ensure consistency if budgetary constraint assumptions were applied to the Status Quo scenario they should also apply to the Policy scenario. Again, there was no evidentiary basis for applying specific assumptions. Accordingly, the Status Quo scenario incorporated an assumption that the government would scale resources sufficiently to meet emerging demand.

4.2 Program Administration Costs

Health Canada – Program Administration Costs are comprised of:

- Salary and Human Resources (HR)-related costs such as Employee Benefits Program (EPB) and staff accommodation costs;
- Operations & Maintenance (O&M) costs for travel, training, supplies and professional contracts;
- Corporate Cost to reflect departmental shared services and overhead; and
- Contract Cost for the Contracted Government Supply.

This latter cost is counted as part of Health Canada's MMAP Cost but is not included in the CBA as a Program Administration cost as it is related to the cost of supply for those persons

accessing the Government Supply. Contract costs are taken into account as part of the User Benefits and Costs.

Salary & HR-Related Costs

Health Canada administrative costs (human resource costs, accommodation, O&M costs) were documented for 2005-06 to 2009-10 as part of a Health Canada (2009) Supplemental Funding Request. The majority of the operational requirements under the Status Quo scenario arise from the administration of the ATP eligibility requirements and the administration and order processing related to the contract Government Supply. As there has been a fairly steady proportion (10%) of ATP persons who rely on the Government Supply for their access to marihuana for medical purposes, this analysis was able to model the Health Canada program administrative costs directly in relation to the total number of persons with ATPs.

The number of full-time equivalent persons (FTE) for FY2010-11 was reported as 33 FTEs and allowed the computation of an average salary cost per FTE ($68,060) based on the total salary cost for the fiscal year. It was assumed that salary costs per FTE were subject to a fixed salary escalator factor (e.g., 2% per year). This allowed the estimation of FTE for the same years for which salary costs were known (2005-06 to 2009-10).

As the activity volume is considered to be proportional to the average number of ATP persons in a fiscal year, a productivity measure was calculated as the ratio of ATP persons to estimated FTE. This showed an upward trend over time that was fitted with a logarithmic function in Figure 4.6.

The logarithmic equation allows for a prediction of the future number of FTEs required for Health Canada program administration in relation to the number of ATPs expected over time in the forecast period.

The MMAP ratio of ATP/FTE in the Status Quo is given by:

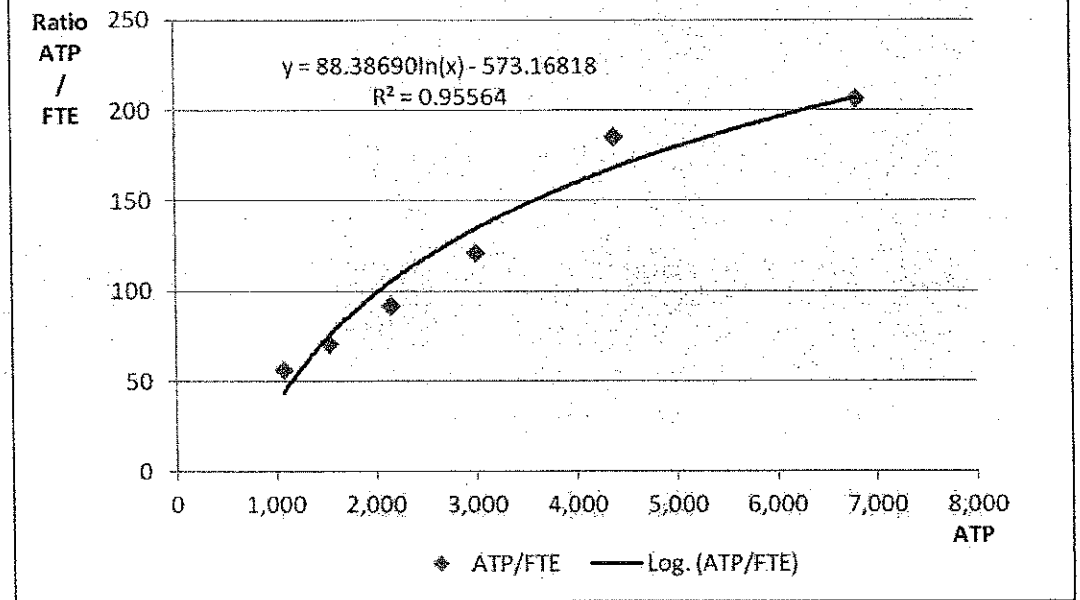
$$(07)\quad ATP/FTE(t) = -573 + 88.4 * LN[ATP(t)]$$

where:

ATP = the forecast number of persons with ATP in future years

LN[ATP] = the natural logarithm of the above.

Figure 4.6 – Status Quo - Productivity Measure
Ratio of ATP Persons per MMAP-FTE
and Fitted Logarithmic Function



Sources: Delsys Research using HC (2009) data and fitted logarithmic function

The number of required MMAP-FTE over time is then given in the Status Quo scenario by:

(08) FTE(t) = ATP(t) / [ATP/FTE(t)]

The average salary per FTE was benchmarked for $68,060 for 2010-11 and was adjusted annually based on a salary escalation factor, so that the salary per FTE over time is then given in the Status Quo scenario by:

(09) Salary/FTE(t) = Base Year Salary * (1 + Escalation Factor)^(t - base year)

where '^' means raised to the power.

The Salary Cost is then given in the Status Quo scenario by:

(10) Salary Cost(t) = FTE(t) * Salary/FTE(t)

Data in the benchmark period (2010-11) indicate that Employee Benefits Program (EBP) and Accommodation costs are proportional to Salary Cost at a fixed percentage (41%).

The EBP & Accommodation Cost is then given in the Status Quo scenario by:

(11) EBP & Accomm Cost(t) = Salary Cost(t) * 0.41

4.2.1 O&M Costs

Data in the benchmark period (2010-11) indicate that O&M costs are proportional to Total Administration Cost at a fixed percentage (20%). As Total Administration Costs = Salary Cost + EPB & Accommodation Cost + O&M Cost, this allows for the following equation for O&M Costs in the Status Quo scenario:

(12) O&M Cost(t) = [.2 / (1 - .2)] * [Salary Cost(t) + EBP & Accomm Cost(t)]

The Health Canada Administration Cost is then given in the Status Quo scenario by:

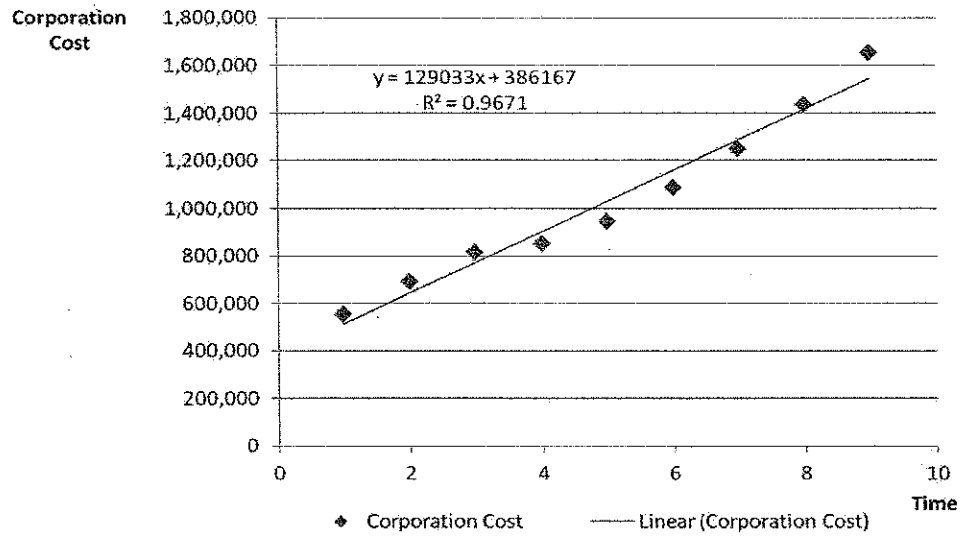
(13) HC-Admin Cost(t) = Salary Cost(t) + EBP & Accomm Cost(t) + O&M Cost(t)

4.2.2 Corporate Cost

Health Canada Corporate Cost includes Human Resources, Finance, Corporate Services and other departmental functional costs that are allocated to program activities such as MMAP.

For FY2005-06 to FY2013-14 (based on HC estimates), the Corporate Cost was a linear function of time as shown in Figure 4.7.

Figure 4.7 – Status Quo – Corporation Cost
Linear Time Model



Sources: Delsys Research

The linear equation allows a prediction of the future Corporate Cost over time in the Status Quo scenario as:

(14) Corporate Cost(t) = 386,167 + 129,033 * (t)

where:

t = a time trend which has values of 10 (FY2014-15) to 20 (FY2024-25).

The sum of Health Canada administrative cost (equation 13) and corporate cost (equation 14) equal the total Program Administration Costs for the Status Quo scenario:

(15) Program Administration Cost(t) = HC-Admin Cost(t) + Corporate Cost(t)

4.2.3 Contract Costs – Government Supply

Health Canada, through Public Works and Government Services Canada (PWGSC) has a contract to cultivate and distribute marihuana for medical purposes to persons authorized to access the Government Supply under the MMAP. The contract terms provide for payment related to a schedule of payments against certain deliverables, the most important of which is the Kilogram (KG) produced to meet the expected MMAP demand.

KG-Demand, Supplied and Produced

The model for KG-Demand for persons eligible to access the Government Supply was estimated based on actual data for KG-Supplied (for FY2005-06 to 2011-12) and an estimate of the Maximum KG-Demand based on the number of ATP persons who are:

- existing ATP-GS at the beginning of the FY (April of the year) who are eligible to access 12 months of Government Supply;
- new ATP-GS during the FY who are eligible (on average) to access 6 months of Government Supply; and
- new ATP-P/D during the FY who are eligible to access 4 months (on average) of 'interim' Government Supply.

From the Fiscal Year forecast of the Total ATP persons, a monthly time series was calculated that allowed, based on parameters for the proportion of Total ATP persons in different supply methods, an estimate of the number of persons in each category as described above.

The mean number of 'Proposed Daily Amount' from the ATP application form for each of the supply categories was obtained, which for 2010-11 showed that the proposed daily amount was significantly higher for DPPL supply (mean=9.0 grams) and PUPL supply (mean=7.6 grams) than for persons accessing the government supply (mean=3.6 grams). The mean across PUPL/DPPL supply was 8.0 grams.

For the years up to FY2009-10, during which ATP persons were able to access the Government Supply without prepayment, there was a significant rate of non-payment (around 20%) – and the 'effective utilization' rate[7] was around 17-20%. In other words, the actual KG-Demand was only 17-20% of what was theoretically possible to have been made available to persons eligible (and likely[8]) to access the Government Supply.

For the FYs after 2010-11 and including an estimate for FY2012-13 (based on one quarter's data[9]) the 'effective utilization' rate following the demand for full pre-payment was around 6%.

The Maximum KG-Demand (Government Supply) is given in the Status Quo scenario by:

(16) Max KG-GS(t) = {[Starting ATP-GS(t) * 12 * 30 * PDA-GS]

+ [New ATP-GS(t) * 6 * 30* PDA-GS]

+ [New ATP-P/D(t) * 4 * 30 * PDA-P/D]} / 1,000

where the first term in each of the three expressions on the right-hand side of the equation is the number of relevant ATP persons eligible to access the Government Supply, the first integer is the months of possible orders in the FY, the second integer is the mean days per month and the last term is the mean Proposed Daily Amount (a maximum) for each category of user.

The KG-Demand is given in the Status Quo scenario by:

(17) KG-Demand(t) = Max KG-GS(t) * Utilization Rate-GS(t)

where the effective utilization rate was assumed to be 6% for the beginning of the forecast period and allowed to rise towards the end of the forecast period as the growth of new ATP persons slows and there was expected to be higher utilization from the persons who start the year as ATP-GS.

It was assumed that the KG-Demand equalled the KG-Supply, as this is an actual transacted market with Health Canada as the intermediary between the consumer and the contracted producer.

The ratio of KG-Supply to KG-Produced was estimated to be 85% for FY2008-09. As a result of reduced demand as a result of pre-payment of orders, this ratio might have fallen to around 50% for FY2009-10. Access was only available for planned expenditures in additional FYs and the actual contracted amounts for KG-Produced were unknown. It was assumed, for the purpose of costing the Government Supply contract, that there was a constant 85% ratio between KG-Supply (and KG-Demand) and KG-Produced.

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[7] The effective utilization rate is the ratio of the KG actual supplied to persons from the Government Supply to this study's estimate of the Maximum KG-Demand, based on the number of persons eligible to access the Government Supply and the maximum amount they were eligible to obtain based on the application 'Proposed Daily Amount'.

[8] The theoretical maximum does not include the persons eligible for Government Supply who never place an order. It includes the existing and new ATP-GS who are expected to make use of the Government Supply and the new PUPL/DPPL persons who are eligible for interim Government Supply.

[9] There was little predictable seasonality in KG-Supply data by month for 2010 and 2011.

The KG-Produced is given in the Status Quo scenario by:

(18) KG-Produced(t) = KG-Supply(t) / 0.85

Government Supply - Contract Cost

Health Canada contracted Government Supply costs were documented for 2005-06 to 2009-10 as part of a HC (2009) Supplemental Funding Request. These costs were in addition to Health Canada administration costs.

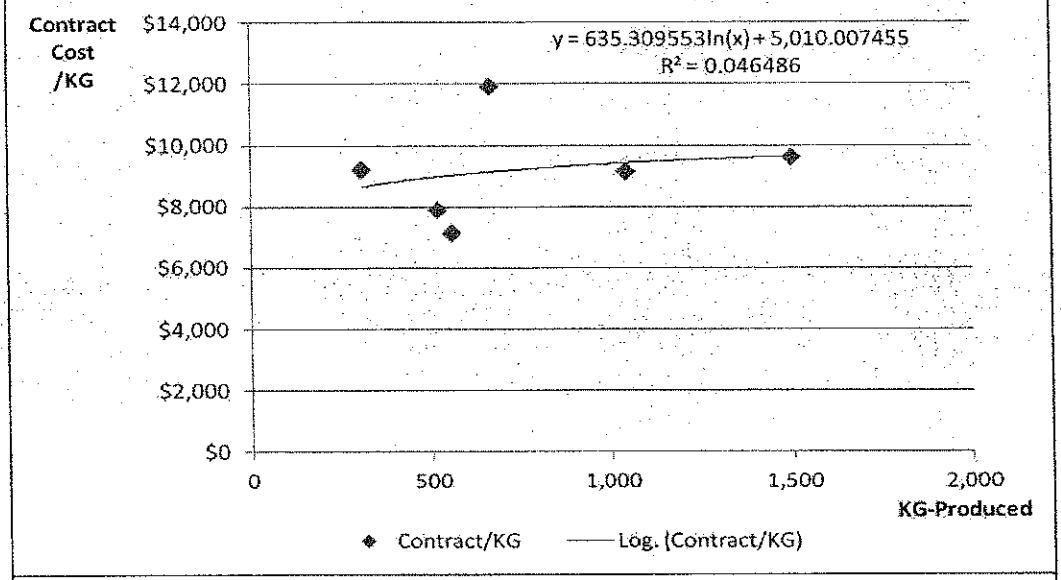
Contract Cost included dried marihuana supply, marihuana seed pouches, various reporting requirements and other miscellaneous work. Payment was made against a schedule of unit costs negotiated in a supply contract between the Government of Canada and the contract Government supplier.

The contracted KG supply costs were known for six fiscal years that spanned the two Supply Contracts signed in 2008 and 2010. There were two prices specified in the Contract: a) a price for 'base quantity' (referred to by Health Canada as 'firm deliverable'); and b) a price for 'optional quantity'. For the purposes of estimating a supply cost, a weighted average was selected, with 90% of the price of the 'base quantity' and 10% of the price for the 'optional quantity'.

These prices were plotted against actual and estimated KG produced for FY2008-09 to 2013-14 in Figure 4.8. There was a poor fit to the data as there was an increase for prices in the 2010 contract over the 2008 contract, but in each of these contracts there was (generally) declining prices over the three fiscal years of the contract. This produced a 'ratcheting' movement over time. Even though the estimated fit of a logarithmic function was poor, this model was used, as it made full use of available data[10].

[10] While the statistical 'fit' of the logarithmic regression is poor it still captures the (generally) upward movement over time (between successive Contracts) but at a declining rate that seems to be reflected by the decrease over time for the years of any particular Contract. Neither the slope not intercept parameter had much impact on the variation of the NPV results.

Figure 4.8 – Status Quo – KG Supply Cost
Relation of KG-Supply Cost and KG-Produced
and Fitted Logarithmic Function



Sources: Delsys Research

The logarithmic equation allowed a prediction of the future KG supply cost over time in the Status Quo scenario as:

(19) KG Supply Cost(t) = 5,010 + 635.3 * LN[KG(t)]

where:

LN[KG(t)] = is the natural logarithm of forecast KG-produced over time.

An estimated KG Cost was then calculated, based solely on the KG Supply Cost and the KG-Produced forecast. This value would not represent the full Contract Cost as it excludes the costs associated with seeds, reporting and miscellaneous work requirements for which the contract supplier is compensated under the contract. It does represent the bulk of the Contract Cost.

Estimated KG Cost over time in the Status Quo scenario is given by:

(20) Estimated KG Cost(t) = KG-Produced(t) * KG Supply Cost(t)

A comparison of the relationship for the observed and estimated period for FY2005-06 to FY2013-14 can be made between the Health Canada reported Contract Cost (for all items) and the Estimated KG Cost. This ratio has fluctuated from 67% to 92% over time. This study assumed that the Estimated KG Cost represented a fixed 90% ratio to Contract Cost over the forecast period.

Estimated Contract Cost over time in the Status Quo scenario is given by:

(21) Contract Cost(t) = Estimated KG Cost(t) / 0.90

4.2.4 Program Cost

The total Health Canada Program Cost for the MMAP is the sum of the Program Administrative Cost and the Contract Cost.

Total Program Cost over time in the Status Quo scenario is given by:

(22) Total Program Cost(t) = Contract Cost(t) + Program Administrative Cost(t)

For the purposes of the CBA it is important to note that the Administrative Cost component was treated as an economic cost of the program administration while the Contract Cost was treated as the supply cost associated with a market transaction in the estimation of Consumer Surplus and Producer Surplus.

4.2.5 Status Quo – Business Compliance Cost

It was assumed that Regulatory Compliance Cost was 10% of the Contract Cost. There was no available evidence to support this assumption but the best available information was that the new regulations governing LP supply security and reporting requirements would be less onerous than those embedded in the Government Supply contract.

Compliance Cost over time in the Status Quo scenario is given by:

(23) Compliance Cost(t) = Contract Cost(t) * 0.10

4.2.6 Status Quo – Government Supply Curve

The Government Supply Curve is the relationship between KG-Demand and Supply Price per KG over time. This differs from the Estimated Contract Cost as it: a) excludes the Compliance Cost component; and b) uses KG-Demand as the denominator (rather than KG-Produced).

Generally, the volume of seeds produced and supplied is a trivial component of the Supply Contract and is omitted from these calculations.

The Supply Price per KG-Demand over time in the Status Quo scenario is given by:

(24) Supply Price/KG-Demand(t) = [Contract Cost(t) * (1 - 0.10)] / KG-Demand(t)

When the Supply Price per KG-Demand and the KG-Demand are plotted over time for the forecast period, an upward sloping Government Supply Curve is obtained.

The linear equation for the Government Supply Curve over time in the Status Quo scenario is given by:

(25) Supply Price/KG-Demand(t) = 11,511 + 0.160595 * KG-Demand(t)

where

S-Intercept-GS = 11,511

S-Slope-GS = 0.160595 (times the quantity supplied in KG)

4.3 Status Quo– User Benefits & Costs

The existence of a market for transacted quantities of marihuana for medical purposes allows an inference, from observed and estimated market quantities and prices and parameters related to linear Demand and Supply curves, of measures of welfare in the form of Consumer Surplus and Producer Surplus. Before formulae for these welfare measures can be derived, intercept and slope parameters for the Supply and Demand curves must be developed. For the Demand curve, the single parameter assumed in this study will be the Price Elasticity of Demand.

4.3.1 Price Elasticity of Demand

Marihuana is a controlled substance and shares many of the demand characteristics of illegal drugs. Demand for illegal drugs has been found to be price inelastic, meaning that the percentage change in quantity demanded is less than the (absolute value) of the percentage change in price.

Mathematically, own-price elasticity of demand ε_p is defined in this study as:

ε_p = %Δ in quantity / %Δ in price = d(ln q) / d(ln p)

where d is the differential operator and ln is the natural logarithm function, q is quantity demanded and p is price.

A comprehensive assessment of US marihuana demand [Rhodes et al (2000)] found evidence that ε_p was in the inelastic range of -0.25 to -0.50 for young people and less frequent adult users. Marihuana price elasticity was:

- lower in the short term than the long term [Becker et al (2006) show that habits change slowly for products with physical and/or social addiction];

- lower for frequent versus first-time users than for regular users [Bretteville-Jensen (2006) shows higher price elasticity among heavy users of heroin]; and

- lower for young adults than for older users.

A comparable form of price responsiveness has been found for a 'participation' elasticity which measures the relationship between price changes and the number of users. A participation elasticity for marihuana of about -0.3 is reported [Kilmer et al (2010)].

The demand for marihuana for medical purposes from a legal source might differ from the demand for marihuana as an illicit substance and might be closer to that for prescription drugs. It is important to note that marihuana is not an approved therapeutic product in Canada.

Qualification – Marihuana for Medical Purposes is not an Approved Therapeutic Product
Marihuana for medical purposes is not an approved therapeutic product and the scientific studies of the safety and efficacy of marihuana for medical (therapeutic) purposes are generally inconclusive [Health Canada (2010)].
HC (2010) Marihuana (marijuana, cannabis) – (Information for Health Care Professionals)

With this qualification, it may still be that the demand for marihuana for medical purposes exhibits similarities (in terms of consumer preferences and price sensitivity) to demand for prescription drugs. At the very least, individual Canadians appear to perceive there to be anecdotal therapeutic benefit of marihuana consumption in relation to various disease conditions.

The price elasticity of demand for prescription drugs in Canada has been estimated at $\varepsilon_p = -0.10$ to -0.15 [Contoyannis et al (2005)] or very inelastic.

Prescription drug price elasticity was:

- lowest ($|\varepsilon_p| < 0.20$) for lowest income/lowest usage and for moderate income/highest usage;

- highest ($|\varepsilon_p| > 1.0$) for higher income/low-to-moderate usage.

Another study [Kapur-Basu (2005)] found a similar non-linear relationship between drug expenditures and household income with an overall (average) income elasticity for prescription drugs of ε_y approx = 0.

Empirical evidence for Canada does not indicate much price sensitivity (in terms of out-of-pocket costs) for prescription drug demand for changes in price. The low price elasticity of

demand for prescription drugs is a result of medical need and the generally low out-of-pocket cost for prescription medicines after insurance (public and private) plan coverage[11].

The combined evidence from both marihuana use (as an illegal substance) and from prescription drug use (as a legal substance) indicate that the price elasticity of demand for marihuana for medical purposes is likely to be low (inelastic) and in the range of ε_p = -0.10 to -0.50 (with a median value of ε_p = -0.25). It was therefore expected that the Marshallian demand curve for marihuana for medical purposes would be downward sloping with a steep slope indicating highly price inelastic.

For the purpose of the CBA study, linear demand and supply curves were assumed. These are the simplest economic specification and facilitate calculation of Consumer Surplus and Producer Surplus measures. They also require the fewest assumptions (e.g., intercept and slope) which must be inferred based on minimal empirical evidence.

The price elasticity of demand for a linear demand curve varies at different points along the curve, with high price elasticity at points near the y-axis intercept (i.e. zero demand) and low price elasticity at points near the x-axis (i.e. maximum demand) intercept point. The assumption that the Status Quo scenario supply markets all exhibit inelastic demand (at the observed positions of supply price and actual consumption) means that the observed market position is found towards the lower right-hand arc of the demand curve close to the x-axis.

Annex 1 contains a comprehensive discussion of the concepts of Consumer and Producer Surplus and the challenge of estimating the impacts of a policy change that involves:

- the existence of an effective consumer subsidy in the Status Quo scenario; and
- a Policy scenario that removes the effective subsidy and also allows for more efficient, lower cost supply.

For the case of the portion of the market that involves the Government Supply, this is effectively what occurs between the Status Quo and the Policy scenarios.

Measures of Consumer Surplus and Producer Surplus were estimated for three categories (i.e., separate markets) of persons with ATP:

1. Government Supply Market: persons who access marihuana for medical purposes from the Government Supply through Health Canada;
2. Personal Use Market: persons who supply their own marihuana for medical purposes from self-cultivation; and
3. Designated Person Market: persons who access a supply of marihuana for medical purposes from a designated person who grows it for them.

These categories were treated as separate markets for two main reasons: a) the supply price is estimated to be very different between these markets; and b) the product characteristics of the

[11] At present (2012), expenses to acquire marihuana for medical purposes are not eligible for reimbursement under Provincial/Territorial Drug/Health plans. For this reason the Status Quo scenario assumes that 100% of the cost of accessing a legal supply of marihuana for medical purposes is borne by the user.

marihuana may vary considerably between the Government Supply (i.e., a single strain of cannabis) and 'private production' (i.e. which may involve many strains of cannabis). The available literature on cannabis use suggested that certain users have a marked preference for certain strains of cannabis. There was no scientific evidence as to the actual or possible therapeutic properties of different strains of cannabis.

4.3.2 Government Supply Market

A Government Supply curve was estimated in equation 25. This involved a linear relationship between the KG-Demand and the Supply Price per KG-Demand. For the purpose of estimating Consumer Surplus and Producer Surplus, the Government Supply curve Slope was kept constant at the value (0.160595) in equation 25 and the Supply curve Intercept was allowed to vary slightly over time so as maintain the constant slope at the equilibrium values (Supply Price per KG-Demand, KG-Demand) determined from equations 24 and 17 above.

The slope of an upward-sloping line is given by the ratio:

Slope = Rise / Run = (Δvertical / Δhorizontal)

The Δvertical up the y-axis (price) is given by the difference between a point on the Supply Curve (i.e. Supply Price per KG-Demand) and the Supply Intercept.

The Δhorizontal along the x-axis (quantity) is given by the difference between KG-Demand and Zero (i.e. the quantity associated with the Supply Intercept).

Therefore:

Slope = (Supply Price per KG-Demand - Supply Intercept) / (KG-Demand - 0)

This equation can be rearranged to solve for the value of the Supply Intercept. The Government Supply curve Intercept over time in the Status Quo is given by:

(26) Intercept-GS(t) = Supply Price per KG-Demand(t) – [KG-Demand(t) * Slope-GS]

The definition of the price elasticity of demand is:

Price Elasticity ε_p = %Δ in quantity / %Δ in price

One point on the Demand curve (for the Government Supply) is known, as this is the point (observed or forecast) that results in quantity KG-Demand at the User Price ($5.00/gram * 1,000 grams = $5,000/KG).

In order to estimate the value of the Demand Intercept, the known point and the Price Elasticity of Demand can be utilized. By definition, the Demand Intercept is the point where the Demand curve intersects the y-axis and the quantity demanded is equal to zero. This corresponds to a -100% change in quantity. Therefore, the associated % change in price can be determined.

%Δ in price = %Δ in quantity / ε_p

The %Δ in price associated with the movement from the point (User Price, KG-Demand at User Price) to the Demand Intercept is given by:

$\%\Delta$ in price = (Price Intercept – User Price) / User Price

These two equations can be brought together to give the following value of the Demand Intercept. The Demand curve Intercept (for the Government Supply) over time in the Status Quo scenario is given by:

(27) Intercept-D(t) = User Price(t) [1 – (1.0 / ε_p)]

With two points of the Demand curve specified – the y-axis intercept and the observed transaction point (User Price, KG-Demand at User Price) – and the assumption that this curve is linear, it is possible to calculate the Demand curve Slope (which is negative as the curve is downward-sloping).

The Demand curve Slope (for the Government Supply) over time in the Status Quo scenario is given by:

(28) Slope-D(t) = [User Price(t) – Intercept-D(t)] / KG-Demand(t)

One characteristic of a constant Price Elasticity of Demand and a constant Demand Intercept is that the Demand Slope declines (in absolute value) as the scale of the market (i.e., KG-Demand) increases.

As shown in Figure 4.9, the Government Supply users (ATP-GS and those who are new ATP-P/D who access an interim supply) face an (effectively subsidized) User Price ($5,000/KG) when they consume KG-Demand. The actual cost associated with KG-Demand is the higher Supply Cost.

In the absence of an effective subsidy, users would face a price slightly less than the Supply Cost (associated with KG-Demand) and would consume at KG*-Equilibrium. Note that the Supply curve (while somewhat flat) is not horizontal, and has a positive slope.

Because the equations for the Supply and Demand curves are known and the equilibrium is determined by their intersection, it is possible to determine the value of KG*-Equilibrium.

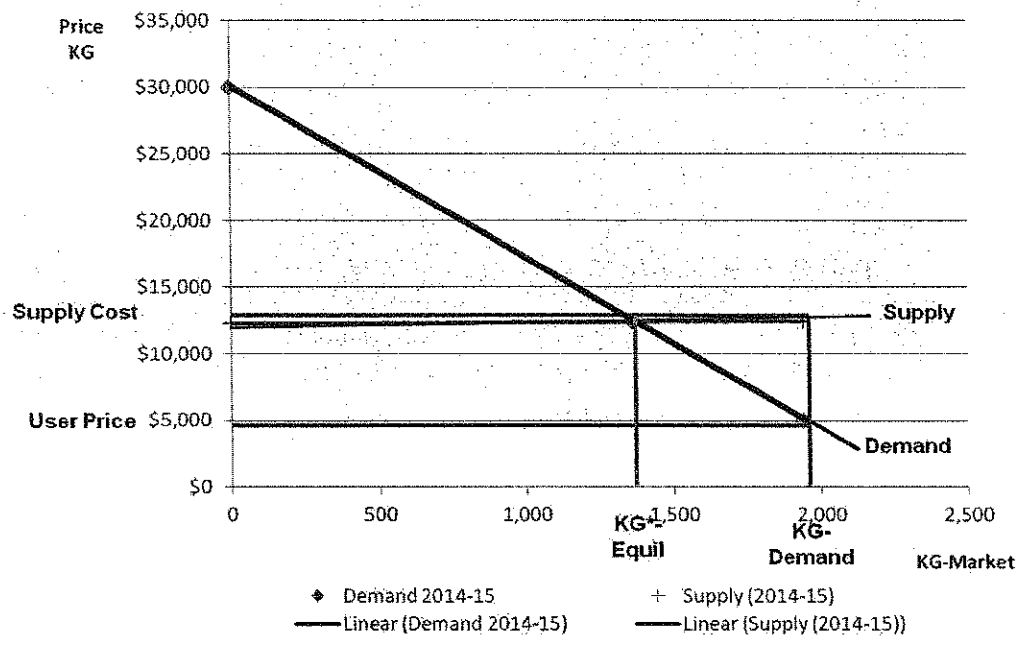
If the Demand and Supply curves are given by:

Supply Curve = Intercept-GS(t) + (Slope-GS * KG)
Demand Curve = Intercept-D - (Slope-D(t) * KG)

then it can be determined that the KG*-Equilibrium over time in the Status Quo scenario is given by:

(29) KG*-Equilibrium(t) = [Intercept-D – Intercept-GS(t)] / [Slope-GS + Slope-D(t)]

Figure 4.9 – Status Quo – Government Supply
Demand & Supply Curves Showing KG*-Equilibrium
and KG-Demand at (Effectively Subsidized) User Price



Sources: Delsys Research
NB: as supply curve is flat-ish it is not possible to show equilibrium price line.

The associated P*-Equilibrium can then be found using the above value for KG*-Equilibrium and either the Supply or Demand equations.

Using the Demand curve equation, P*-Equilibrium over time in the Status Quo scenario is then given by:

(30) P*-Equilibrium(t) = Intercept-D + [Slope-D(t) * KG*-Equilibrium(t)]

Consumer Surplus-GS

Consumer Surplus is a measure of the user benefit not captured in the market transaction. As the Demand curve represents the marginal willingness-to-pay for consumption, Consumer Surplus is the integral of marginal willingness-to-pay above the transacted value. This is (for an unsubsidized market) the area under the Demand curve and above the price line at the market equilibrium quantity.

For a situation of a subsidized market, as is the case here, the Consumer Surplus (Government Supply) is the area under the Demand curve and above the Supply Cost associated with the User Price at the KG-Demand[12]. While the Supply curve is very flat, it is not horizontal. In order

[12] See Annex 1 for a more detailed explanation of this point.

to correctly estimate the Consumer Surplus, it is necessary to find the KG'-Demand that is associated with the Supply Price per KG.

Using the Demand Curve equation, KG'-Demand over time in the Status Quo scenario can be determined by:

(31) KG'-Demand(t) = [Intercept-D - Supply Price per KG-Demand] / Slope-D(t)

Consumer Surplus can be estimated using a geometric formula which exploits the fact that, with linear Demand and Supply curves, the areas to be measured are triangles whose area is half that of the associated rectangles.

Consumer Surplus (Government Supply) over time in the Status Quo scenario is given by:

(32) CS(Govt Sup)(t) = 0.5 * [Intercept-D - Supply Price per KG-Demand(t)]

* KG'-Demand(t)

Producer Surplus-GS

For reasons explained in Annex 1, there is no Producer Surplus (Government Supply), as the market is subsidized and the marginal cost of production is always above the (effectively) subsidized price.

Deadweight Loss-GS

Deadweight Loss is the cost of producing at a quantity that exceeds KG*-Equilibrium such that the social value (i.e. willingness-to-pay) is less than the marginal cost of production. This occurs in markets where there is a subsidy or tax that creates a 'price wedge' between what users pay and what suppliers receive in a market transaction. The Deadweight Loss (Government Supply) over time in the Status Quo scenario is given by:

(33) DWL(Govt Sup)(t) = {0.5*[P*-Equil(t) - User Price(t)] * [KG-Dem(t) – KG*-Equil(t)]}

+ {0.5*[Supply Price(t) - P*-Equil(t)] * [KG-Dem(t) – KG*-Equil(t)]}

The Deadweight Loss calculation requires the area of two triangles to be calculated.

This completes the discussion of the Government Supply market in the Status Quo scenario.

4.3.3 **Personal-Use Supply Market**

Equation 2 gives the number of persons with a PUPL who self-supply their marihuana under the MMAR in the Status Quo scenario.

Personal Use – Supply Cost

The estimate for Supply Cost (Personal Use) used in the CBA model was based on an Activity-Based Costing (ABC) model which follows the analysis of small-scale indoor marihuana production [Kilmer et al (2010), Caulkin (2010)]. The model converted from US imperial/dollar units to Canadian metric/dollar units and replaced certain values (e.g. electricity cost per kwh)

with Canadian values. In addition, the opportunity cost for residential facility space and own time was included.

The maximum number of allowable plants for the mean Proposed Daily Amount (for ATP-P persons) was calculated using the Health Canada formula. For a mean PDA of 7.6 grams, this corresponded to 37 marihuana plants. The space requirement for this number of plants was based on 15 plants per square metre. The dried marihuana yield was 30 grams per plant per harvest and there was an assumed 3 harvests per year.

Variable labour cost was calculated using an assumption that each harvest (for this quantity of plants) required 60 labour hours and an opportunity cost of $10.00 per hour. Estimates of growing medium/supplies, electricity, space cost (for growing, drying and supplies) and equipment requirements were also used. There was also an estimate of fixed labour (equipment set-up) costs in addition to space usage cost based on a proportion of amortized housing cost.

The resulting Supply Cost (Reference case) was estimated at $1.80/gram (or $1,800/KG). In the CBA analysis, the sensitivity of the results was tested by allowing this parameter to vary over a range of values.

Table 4.1 – Status Quo – Personal-Use Supply Cost

Cost Summary per m^2 of Grow Area	Per Harvest	Per Year
Variable Consumables & Power	$222	$667
Variable Labour	$240	$720
Fixed Space & Equipment & Labour	$210	$631
Total Cost	$673	$2,018

Cost Using m^2 of Grow Area	Per Harvest	Per Year
Variable Consumables & Power	$555	$1,666
Variable Labour	$600	$1,800
Fixed Space & Equipment & Labour	$526	$1,579
Total Cost	$1,682	$5,045

Assumed Personal Use (Grams)	2,774

Cost per Gram of Use	Per Year
Variable Consumables & Power	$0.60
Variable Labour	$0.65
Fixed Space & Equipment & Labour	$0.57
Total Cost	$1.82

Sources: Delsys Research

Personal Use – KG-Demand

As with Government Supply users, a Maximum KG-Demand for Personal Use was calculated based on the mean PDA (7.6 grams) for ATP-P persons and the maximum number of days that persons could consume, allowing for persons who were ATP-P at the start of the Fiscal Year to consume for 12 months (at 30 days per month) and new ATP-P persons to consume for 3 months, on average (after they have successfully harvested their first crop, during which they are eligible to access the government supply for 4 months).