Trends in medical cannabis use in Canada, 2001-2016

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Introduction

Canada has regulated the medicinal use of cannabis since 2001. The regulations that govern patient eligibility and authorization have evolved over time. Briefly, from 2001 to 2013, Health Canada allowed severely ill patients to use cannabis, provided that the patient's physician was supportive. In a controversial 2014 decision, Health Canada ceded cannabis gatekeeping to physicians and nurse practitioners.[1-3] Health Canada did not restrict the indications for cannabis use, although daily cannabis doses were capped at 5 grams. The provincial Colleges of Physicians and Surgeons (hereafter, the "Colleges"), however, imposed their own prescribing restrictions. These include *inter alia* requirements that the physician meet with the patient at least every 3 months, assess patient addiction risk, and in Quebec, enroll the patient into a research study on cannabis use.[4] None of the regulatory authorities that govern nurse practitioners have allowed cannabis prescribing.

The legal sources of supply have also changed over time. Initially, authorized patients or their designates could grow a limited number of cannabis plants; patients could also purchase dried cannabis from Health Canada. In 2014, authorized patients were instead required to obtain cannabis (in dried form only) via mail order from a "Licensed Producer", a commercial vendor approved and regulated by Health Canada. Patient groups, in turn, successfully petitioned the courts to allow the sale of cannabis oil (in 2015) and again allow patients (or their designates) to cultivate cannabis for personal use (in 2016).

There is little evidence in the literature on the impact of these regulatory changes on the participation of physicians, patients and Licensed Producers in the medical cannabis access program. Yet this information can assist other jurisdictions that are contemplating introducing such a program. This information can also be used to assess the impact on patients and physicians once Canada legalizes the sale and use of cannabis, which is expected in mid 2018.

This paper, therefore, provides evidence on the following facets of the medical access program. We examine trends in physician and patient participation in the program, and in particular, we focus on the impact of the 2014 policy change in which physicians, not Health Canada, granted access to medical cannabis. This change at once reduced the administrative burden on patients and physicians and potentially allowed cannabis to be used by more patients. However, the Colleges imposed their own restrictions so it is unclear how access was affected. To investigate, we examine the relationship between the number and type of prescribing restrictions imposed by the provincial Colleges and medical cannabis access. Medical cannabis access is defined two ways: 1) shipments from Licensed Producers per 100,000 population, and 2) the fraction of regular cannabis users who are enrolled in the medical access program. Regular (i.e. daily or weekly) cannabis use is estimated using a recent national survey of those 15 and older. Finally, we present evidence on the rates of cannabis use by province under the MMAR and MMPR, including total prescriptions dispensed, daily dosages, and cannabis potency.

Methods

The three regulatory regimes

As noted, Canada has permitted the medical use of cannabis under 3 different regulatory regimes. The first of these, the Marihuana Medical Access Regulations (MMAR), were in effect from 2001 to 2013. To gain access, Health Canada required written documentation from the patient's primary physician (and in some cases a physician specialist as well) that the patient was either receiving palliative care or was experiencing debilitating symptoms related to specific medical conditions or treatments, such as severe nausea from chemotherapy, that could not be treated using conventional pharmaceuticals.[5] Approved patients, or their designates, could grow cannabis plants; patients could also purchase dried cannabis from Health Canada. Under the Marihuana for Medical Purposes Regulations (MMPR)[6], which were fully enacted on April 1 2014, physicians independently authorized cannabis use. To do so,

the physician completed a prescription-like form called a Medical Document, which was sent to a Licensed Producer for fulfillment. Health Canada banned personal cultivation. Physician prescribing was governed by Health Canada's 5 gram daily limit and the provincial College rules. In August 2016, the Access to Cannabis for Medical Purposes Regulations (ACMPR) again formally allowed authorized patients (or their designates) to grow cannabis, albeit with more restrictions than under the MMAR. Licensed Producers were permitted to sell fresh cannabis leaves and cannabis oil.

Data analysis

Health Canada provided monthly or quarterly data on 1) the number of physicians, and patients participating in the program; 2) sales by Licensed Producers; 3) average prescribed and consumed daily doses; and 4) the number of patients authorized to cultivate cannabis. To infer trends in the potency of prescribed cannabis, we monitored the on-line product catalogs of Licensed Producers each month for the year ending May 2017, and recorded for each product, the price and the concentrations of the two primary active ingredients, tetrahydrocannabinol (THC) and cannabidiol (CBD). We examined the number of products by level of THC and CBD to infer which products were in highest demand.

We recorded the number and type of prescribing restrictions imposed by each provincial College as of April 2016. We assigned each restriction a score from 0.5 to 4, with larger values representing more onerous restrictions. For instance, the requirement that the prescriber meet with the patient in person to prescribe cannabis was assigned a score of 1. The requirement that the prescriber be the patient's primary physician was assigned a score of 3. We then summed the scores to generate, for each province, a composite cannabis prescribing restriction score. These scores were plotted against province-level data on two measures of medical cannabis access. The first of these is the average number of cannabis shipments from Licensed Producers to registered clients over the three-month period March to May 2016. Rates were expressed as shipments per 100,000 population. Quarterly population data were obtained from

Statistics Canada's CANSIM database. The second measure is the fraction of regular cannabis users who are enrolled in the medical access program. Regular cannabis use was estimated using the public use version of the 2015 Statistics Canada Canadian Tobacco, Alcohol and Drugs Survey. This is a telephone interview of provincial households with land-based telephones. Households were selected using random-digit dialing and questionnaires were administered to a randomly selected household member, age 15 or older, using Computer Assisted Telephone Interviewing. Households from the smaller provinces, and younger individuals were oversampled. Statistics Canada devised survey weights that adjust for household non-response and other factors that make population estimates consistent with known province-age-sex totals. These survey weights were used to estimate the number of individuals 15+ that use cannabis daily or weekly.

Results

Physician and patient participation in the medical access program

Figure 1 plots the number of unique medical cannabis prescribers by month, 2003-5 to 2014-3 (under the MMAR regime) and 2014-4 to 2016-4 (under the MMPR regime). Recall that under the MMPR, physicians (not Health Canada) authorized access to medical cannabis. The effect of this policy change was to reduce the number of physicians participating in the medical access program. The policy change, however, no longer restricted medical cannabis to just severely ill patients. The effect of this was to markedly increase the number of patients registered in the program, as is clear from Figure 2. These two effects imply that participating physicians authorized cannabis use for a larger number of patients after the MMPR was introduced. Indeed, the number of patients per prescriber increased from about 5 under the MMAR regime to over 30 under the MMPR regime (Figure 3).

The use of medical cannabis (as measured by purchases from Licensed Producers) varies considerably by province and this variation could be due to the restrictions that

the provincial Colleges impose on prescribers. To investigate, we graphed the province-specific composite cannabis prescribing restriction score, and medical cannabis access. Medical cannabis access is measured first using shipments from Licensed Producers (Figure 4). (Details on the prescribing restriction score are presented in Table 1.) Rates of cannabis use tend to be lower in provinces with stricter College regulations on cannabis prescribing. There is also some variation in rates of medical cannabis use due to factors other than prescribing restrictions. British Columbia and Manitoba have particularly low rates of use, and Alberta, high rates of use, given their prescribing restriction score. Medical cannabis access is also measured using the estimated fraction of regular cannabis users who are enrolled in the medical access program. These data, presented in Figure 5, are consistent with the Figure 4 data.

Prescribing trends under the MMAR and MMPR

Under the MMAR, most patients elected to cultivate their own cannabis, rather than purchase from Health Canada. Table 2 presents statistics on personal cultivation rates. In December 2013, 28,886 individuals were permitted to grow 2.4 million cannabis plants. The number of cannabis plants authorized per capita were highest in British Columbia and Manitoba. Only 2,007 Canadians were authorized to cultivate cannabis under the ACMPR, at the end of 2016. This represents only 7% of the number of individuals authorized to cultivate under the MMAR. The average daily dose of dry cannabis authorized by Health Canada under the MMAR increased from 5.6 grams/day in 2001 to 20.6 grams/day in 2013. There is no data on the THC and CBD concentrations of cannabis authorized under the MMAR. While Health Canada regulated the number of cannabis plants individuals could grow, potency was unregulated.

Under the MMPR, cannabis prescription rates were 200 per 100,000 population in December 2016 and are increasing exponentially. As Figure 6 indicates, these rates vary markedly by province. Physician prescribed daily doses have been declining over

time, from 4 grams in mid 2014 to 2.4 grams in late 2016.[7] The daily amounts actually used by patients have been smaller and have also been declining; the average daily dosage in late 2016 was 0.8 grams. There are no statistics on cannabis potency but this can be inferred from the Licensed Producer product catalogs. There are now 26 Licensed Producers selling dried cannabis and 19 selling cannabis oil. Figures 7 and 8 display scatterplots of the dried cannabis varieties available in May 2016, and one year later, in May 2017. Products are distinguished by their concentrations of CBD and THC and the marker shade indicates the product price, with darker shades being more expensive. A comparison of the graphs indicates that products have tended to cluster into three categories over time. First, there are varieties low in CBD (5% or less) and with THC concentrations that range from 8% to 26%; these constitute the majority of products on offer. Second, there are varieties with modest concentrations of each THC and CBD (between 5 to 12% of each) and, finally, there are high CBD, low THC (2% or less) varieties.

Table 3 displays the number of dried cannabis varieties and their median price, by THC and CBD concentration, in May 2017. The low CBD products account for 75% of the 145 products available, and most of these (86 products) had THC concentrations between 10 – 20%, and 22 had THC concentrations in excess of 20%. Products low in THC and rich in CBD accounted for 6% of products. Other varieties accounted for about 20% of the total market offerings.

The median of the prices across all 145 products was $9/gram. The median prices of some varieties, such as the THC 2-10%, CBD ≤5% were substantially higher ($15/gram); others, such as the THC 10-20%, CBD ≤5% varieties, were lower ($8.50/gram).

The cannabis oil market, established in late 2015, has experienced rapid growth. In June 2016, there were just 22 products for sale. This number grew to 61 products in May 2017. Figure 9 displays the scatterplot of these 61 cannabis oil varieties, again distinguished by THC and CBD content. About 70% of the products were high in THC

(10% or higher) and low in CBD (5% or lower). Most of these high THC varieties had THC concentrations of 20% or higher. A smaller number of products were high in CBD and low in THC. The median price across all varieties was $2.60 per ml.

Interpretation

Under the MMAR regime, Health Canada restricted cannabis use to severely ill patients. Under the MMPR regime, fully enacted in 2014, physicians could authorize access at their discretion. This policy change markedly reduced the number of physicians and increased the number of patients who participated in the medical access program. Thus, participating physicians now prescribe to a larger number of patients than before. This appears to take place in dedicated cannabis clinics; in April 2017, there were over 100 such clinics across Canada.[8]

Purchases of cannabis from Licensed Producers tend to be lower in provinces with stricter College regulations on cannabis prescribing. This relationship may not be causal; it is possible that the College regulations reflect prevailing societal attitudes towards cannabis use. However, there is also evidence that enrollment in the medical access program, expressed as a share of the estimated number of regular cannabis users, is also lower in provinces with stricter College regulations. Thus, it seems likely that stricter prescribing regulations increase rates of self-medication with cannabis.

There is also some variation in medical cannabis use due to factors other than prescribing restrictions. The low Licensed Producer sales volumes in British Columbia and Manitoba could be due to high rates of personal cultivation in these provinces. Approximately 68% of the 2.4 million cannabis plants authorized under the MMAR regime were grown in BC. If there are, in fact, high rates of personal cultivation, then most of these plants are not authorized under the current regulatory regime, given that the number of patients currently allowed to cultivate is only 7% of the number permitted under the MMAR.

Under the MMAR, Health Canada authorized in excess of 20 grams of dried cannabis doses per day. Physician authorized daily doses declined markedly under the MMPR; they are now 2.4 grams/day. The MMPR also created a regulated, commercial cannabis industry. Over 70% of the cannabis products sold by Licensed Producers are relatively high in THC (10% or higher) and low in CBD. This suggests that patient demand for THC-rich products is particularly high.

The Government of Canada intends to legalize the use of cannabis in 2018. It is not clear if the medical program will continue on after legalization. If the program is cancelled, then this raises questions about physician oversight of the THC rich cannabis products that patients appear to be using. (The literature indicates that cannabis is used primarily to manage pain, insomnia, anxiety and depression.[9,10]) Physician oversight of this cannabis use would appear to be beneficial.

This study, which is the first to assess trends in the use of cannabis under Canada's medical access program, had several limitations. Some information on prescribing trends, such as the potency of prescribed cannabis was not measured directly but instead inferred. Also, this study presents no evidence on the therapeutic use of cannabis outside of the medical access program. Finally, this study presented no information on the health effects of the cannabis used under the program. Each of these areas should be addressed in future research.

References

1. Fletcher J. Marijuana is not a prescription medicine. *CMAJ* 2013;185(5):369.

2. Juurlink DN. Medicinal cannabis: Time to lighten up? *CMAJ* 2014;186(12):897-8.

3. Kahan M, Srivastava A. New medical marijuana regulations: The coming storm. *CMAJ* 2014;186(12):895-6.

4. Authorizing dried cannabis for chronic pain or anxiety: Preliminary guidance from the college of family physicians of Canada. Mississauga: College of family physicians of Canada. 2014. Available: https://www.cfpc.ca/uploadedFiles/Resources/_PDFs/Authorizing%20Dried%20Cannabis%20for%20Chronic%20Pain%20or%20Anxiety.pdf (accessed 2016 Dec. 10).

5. Marihuana medical access regulations. (SOR/2001-227). 2017. Available: http://laws-lois.justice.gc.ca/eng/regulations/SOR-2001-227/page-1.html (accessed 2017 Apr. 20).

6. Marihuana for medical purposes regulations. (SOR/2013-119). 2017. Available: http://www.laws-lois.justice.gc.ca/eng/regulations/SOR-2013-119/ (accessed 2017 Apr. 15).

7. Cannabis market data. 2017. Available: http://www.hc-sc.gc.ca/dhp-mps/marihuana/info/market-marche-eng.php (accessed 2017 Mar. 22).

8. Medical marijuana doctors and clinics in Canada. 2017. Available: https://lift.co/doctors (accessed 2017 Apr. 30).

9. Ware MA, Doyle CR, Woods R, et al. Cannabis use for chronic non-cancer pain: Results of a prospective survey. *Pain* 2003;102(1-2):211-6.

10. Walsh Z, Callaway R, Belle-Isle L, et al. Cannabis for therapeutic purposes: Patient characteristics, access, and reasons for use. *International Journal of Drug Policy* 2013;24(6):511-6.

Figure 1 Number of unique medical cannabis prescribers by month, 2003-5 to 2014-3 (MMAR) and 2014-4 to 2016-4 (MMPR)

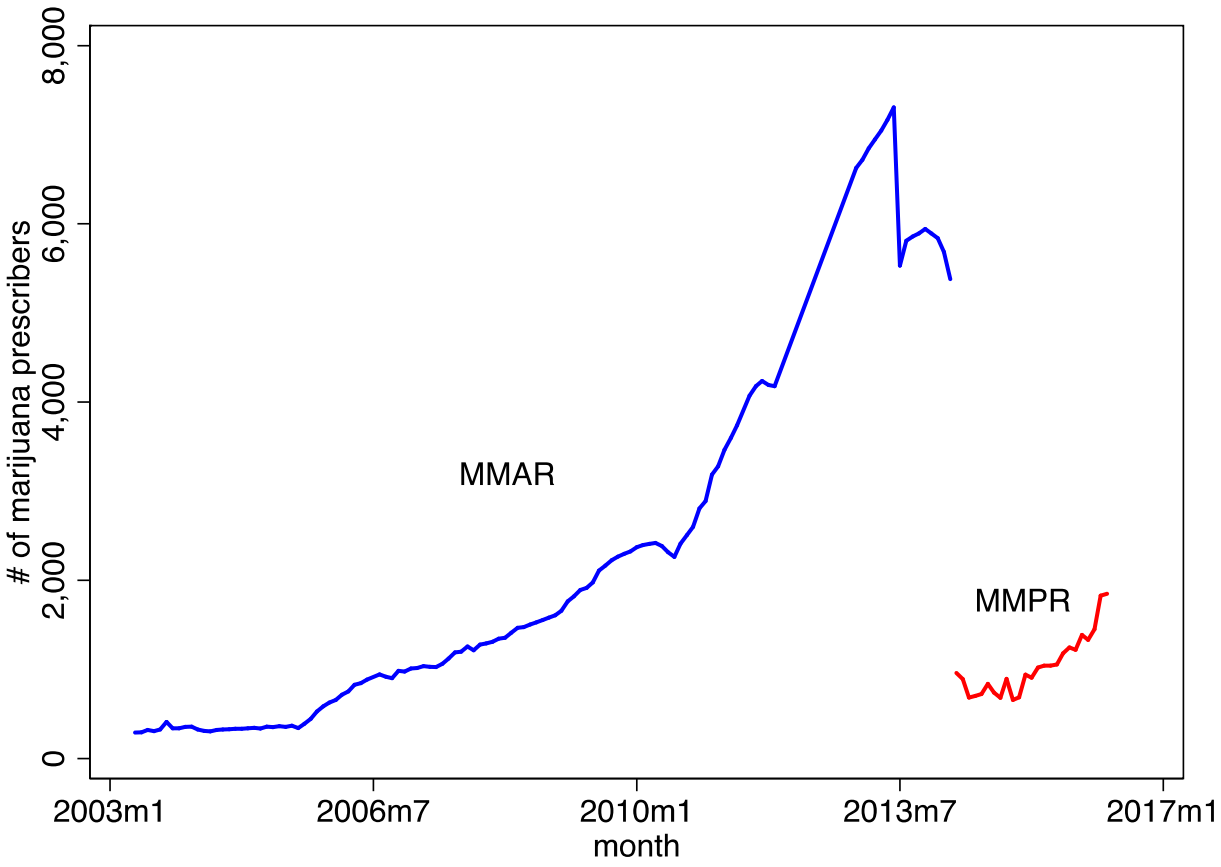

Figure 2 Number of registered clients by month, 2003-5 to 2014-3 (MMAR) and 2013-11 to 2016-12 (MMPR)

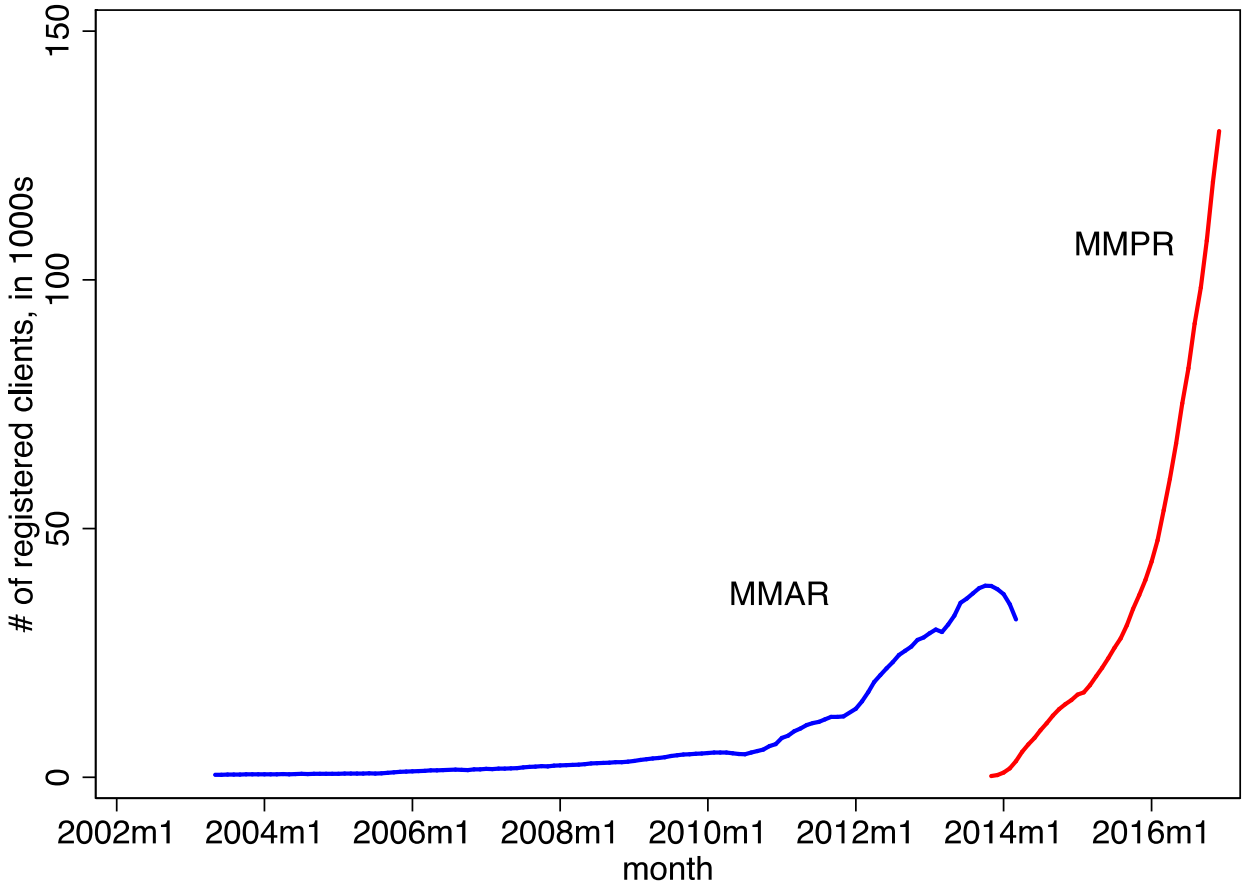

Figure 3 Number of registered clients per prescriber, by month, 2003-5 to 2014-3 (MMAR) and 2014-4 to 2016-4 (MMPR)

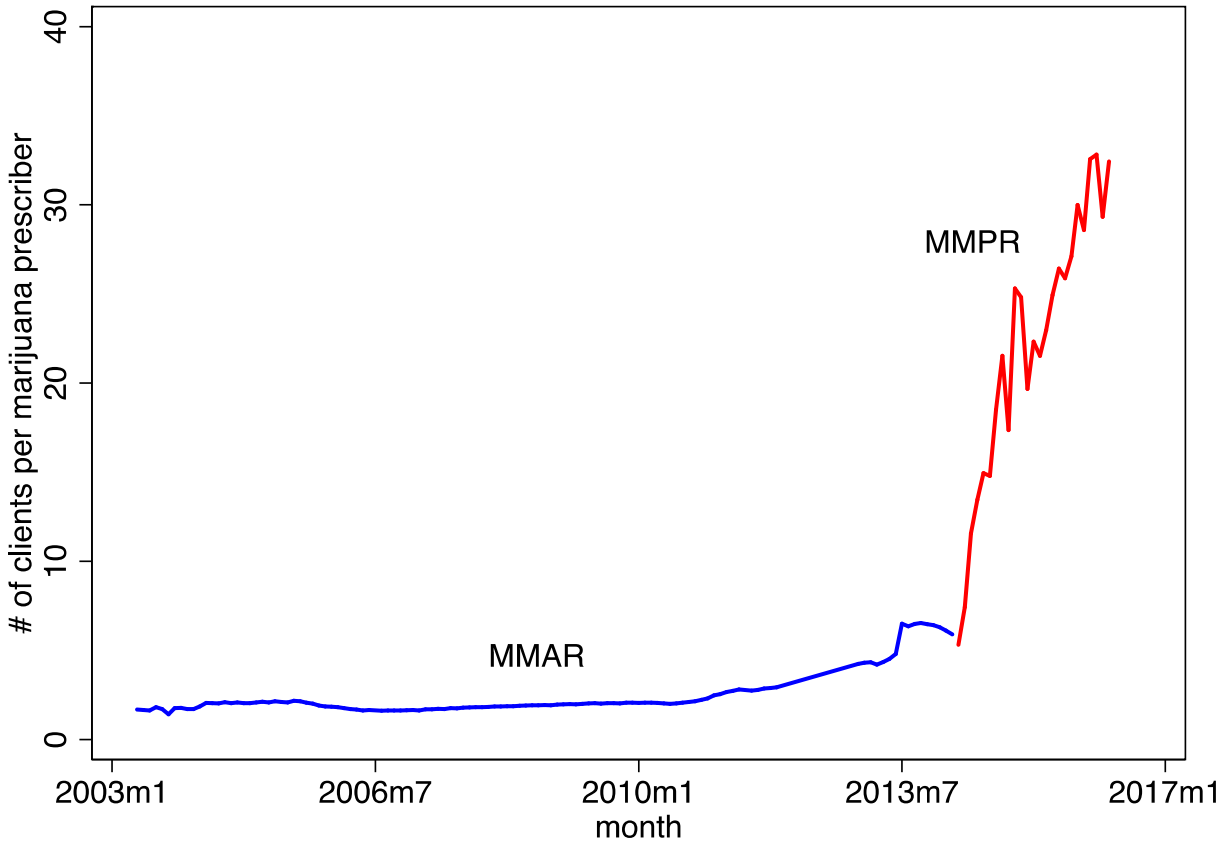

Figure 4 Number of cannabis shipments from Licensed Producers per 100,000 population and composite cannabis prescribing restriction score, by province.

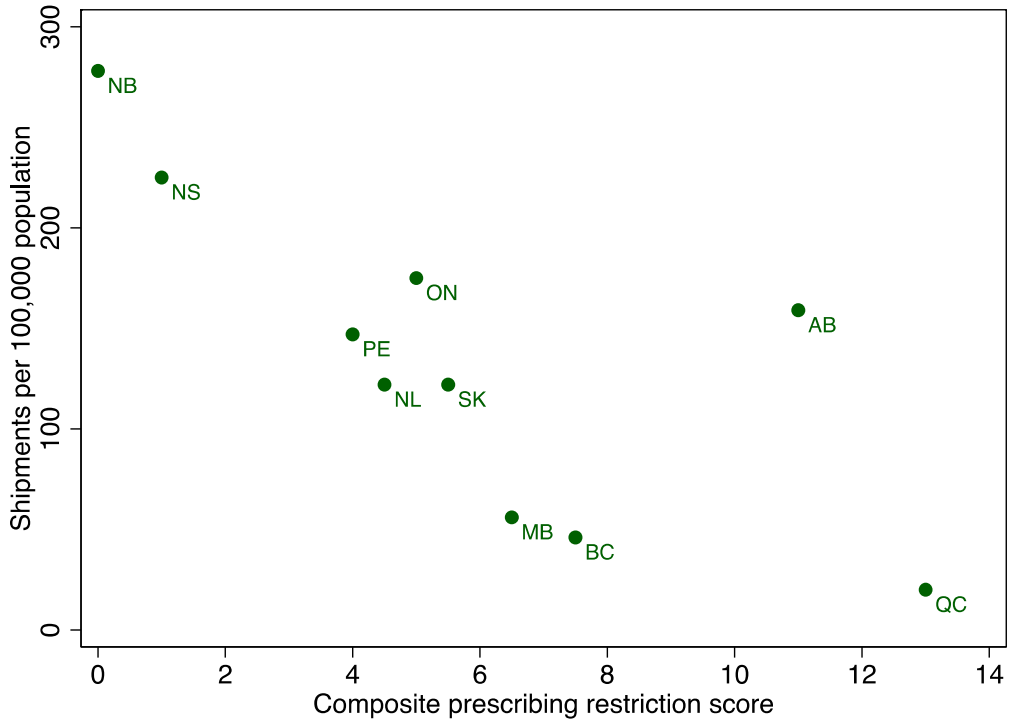

Figure 5 Ratio of medical access program enrollment to the number of regular cannabis users, and composite cannabis prescribing restriction score, by province.

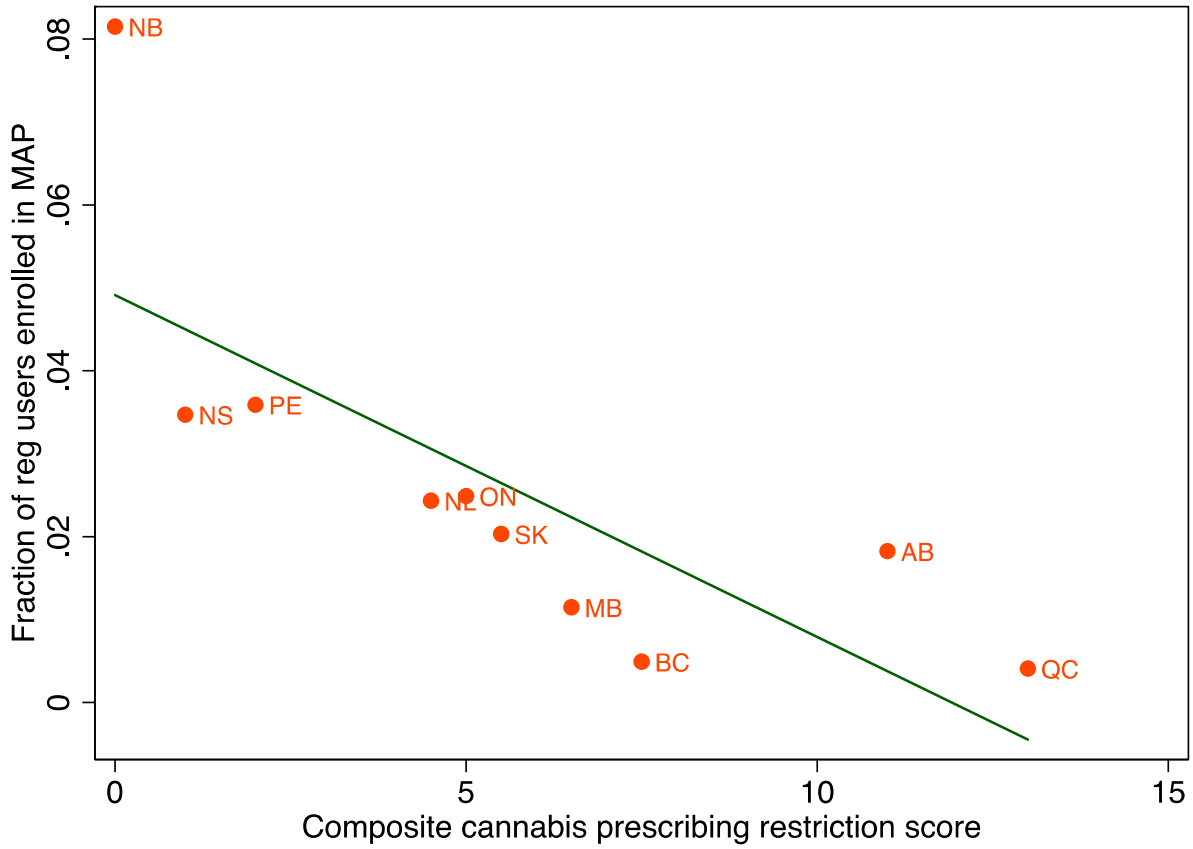

Figure 6 Number of cannabis shipments from Licensed Producers per 100,000 population by month and province

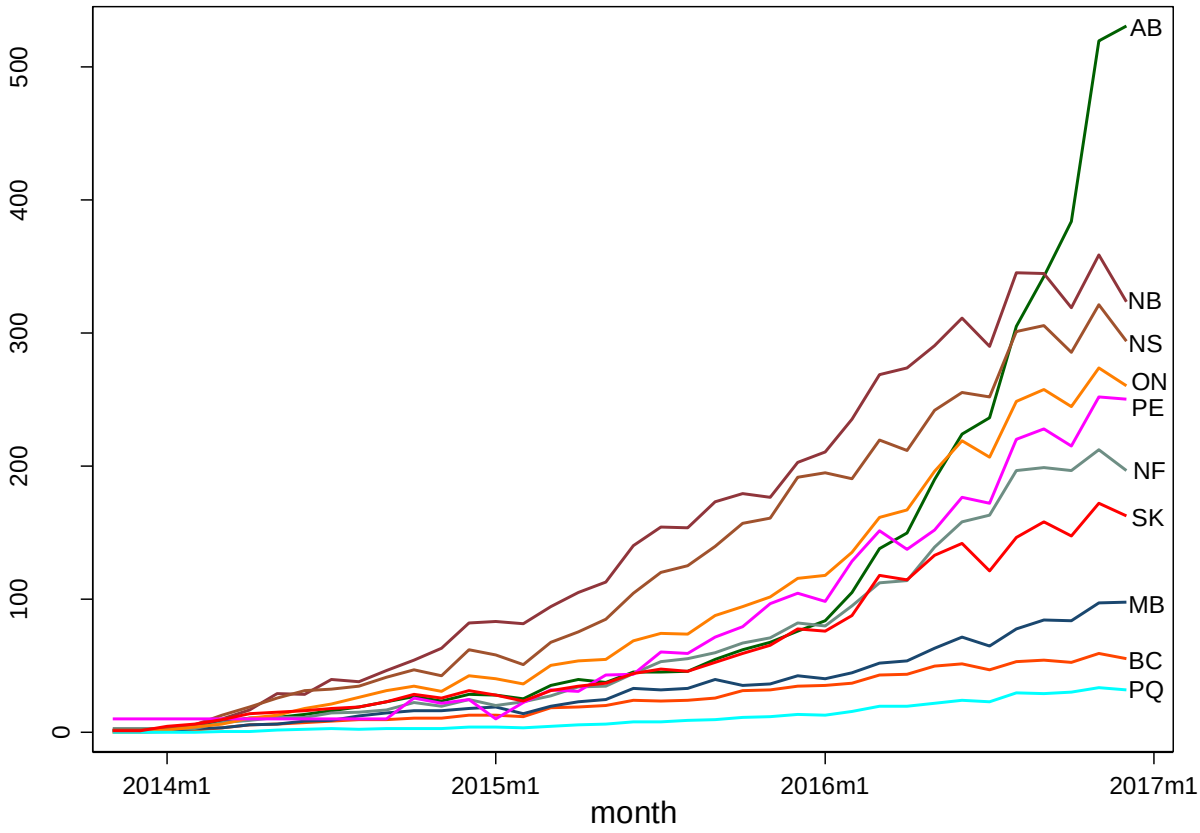

Figure 7 Prices and potency of dried cannabis available from Licensed Producers, May 2016

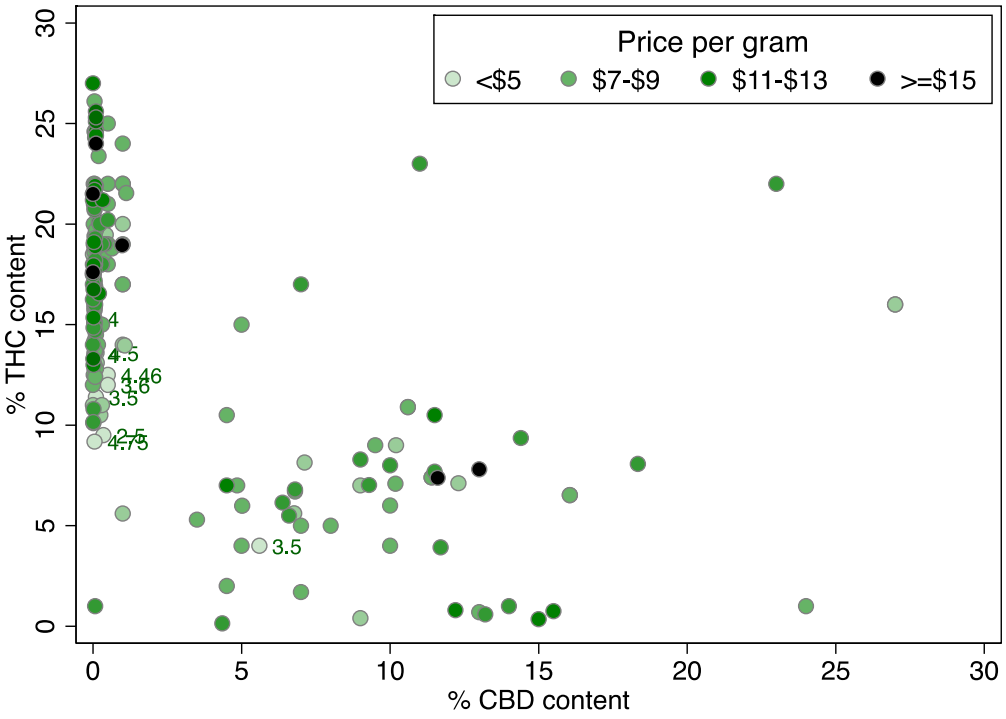

Figure 8 Prices and potency of dried cannabis available from Licensed Producers, May 2017

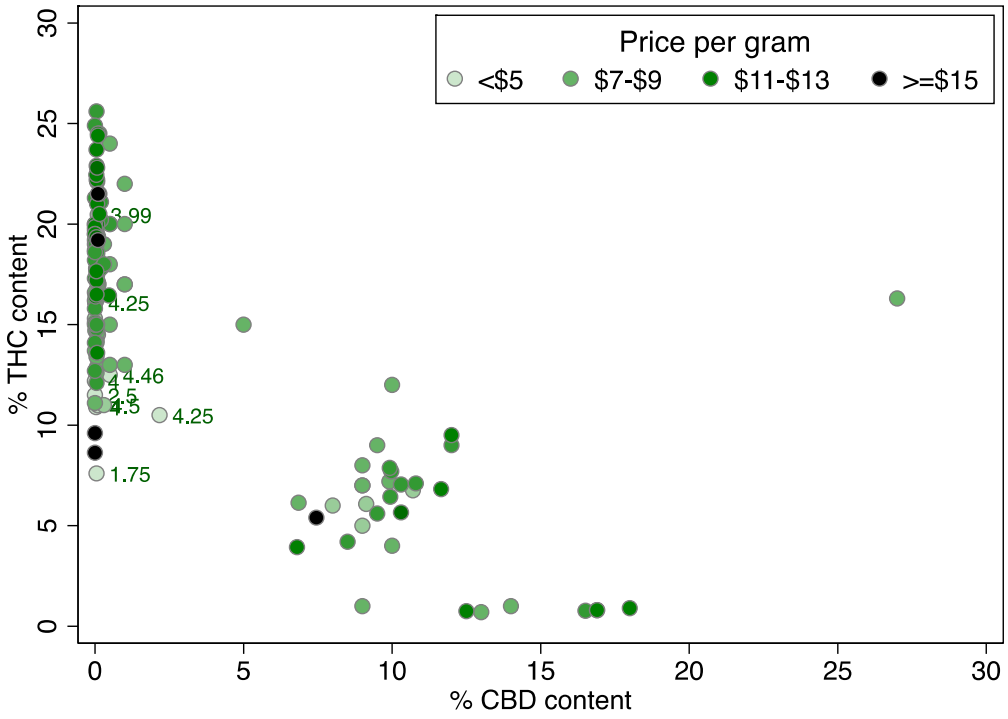

Figure 9 Prices and potency of cannabis oil available from Licensed Producers, May 2017

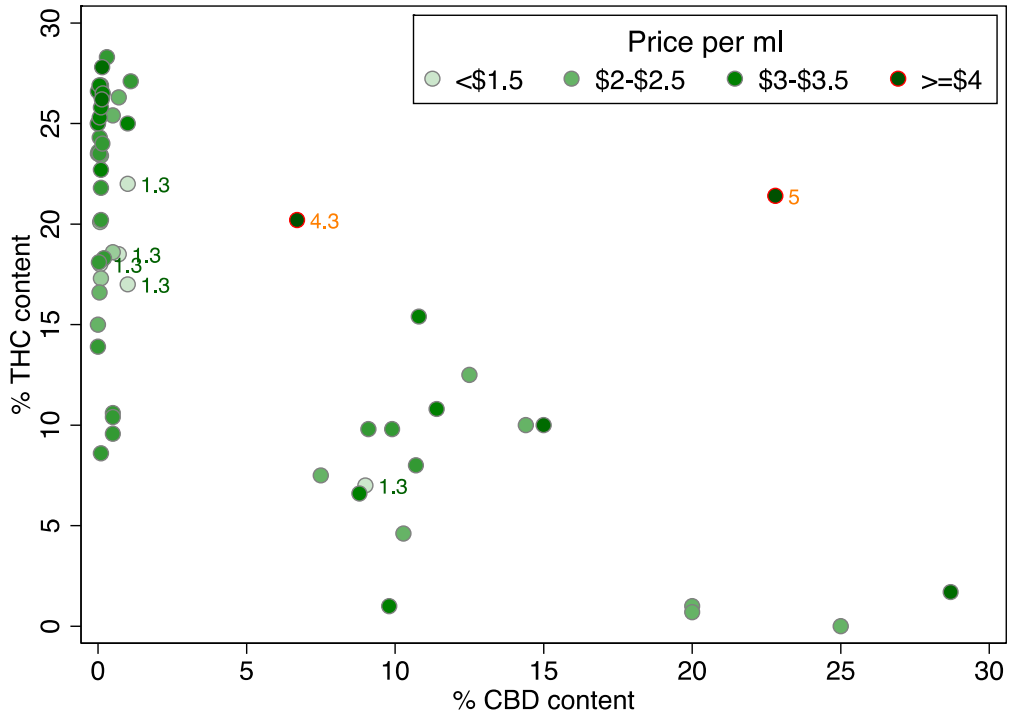

Table 1 Provincial College of Physician restrictions on prescribing of medical cannabis, by province, April 2016.

	province									
prescribing physician must …	**bc**	**ab**	**sk**	**mb**	**on**	**pq**	**nb**	**ns**	**pe**	**nl**
meet with patient every 3 months		3				3				
register with regulator as cannabis prescriber		2								
review patient's medicines use	2	2								
send in Medical Document to LP						1				
be patient's primary physician			3	3						
meet patient in person to prescribe	1							1	1	
have patient sign written treatment agreement			1		1	1				
have patient enroll in research study						2				
create and maintain registry of patients using cannabis						4				
have patient sign consent form	1					1			1	
assess patient risk of addiction using standardized tool	1.5	1.5			1.5					1.5
implement process to identify patient misuse	2	2		2	2				2	2
keep medical documents separate for inspection by regulator			1	1		1				1
specify THC percentage on Medical Document					0.5					
specify medical condition on Medical Document		0.5	0.5	0.5						
composite cannabis prescribing restriction score	**7.5**	**11**	**5.5**	**6.5**	**5**	**13**	**0**	**1**	**4**	**4.5**
Higher scores indicate more restrictions										

Source:

Canada-wide
https://www.cmpa-acpm.ca/-/medical-marijuana-new-regulations-new-college-guidance-for-canadian-doctors
http://www.cfpc.ca/uploadedFiles/Resources/_PDFs/Authorizing%20Dried%20Cannabis%20for%20Chronic%20Pain%20or%20Anxiety.pdf

BC

https://www.cpsbc.ca/files/pdf/PSG-Marijuana-for-Medical-Purposes.pdf

AB
http://www.cpsa.ca/standardspractice/cannabis-for-medical-purposes/

SK
http://www.cps.sk.ca/Documents/Legislation/Legislation/RegulatoryBylaws.pdf PAGE 49-50

MB
http://cpsm.mb.ca/cjj39alckF30a/wp-content/uploads/ByLaws/By-Law-11.pdf PAGE20

ON
http://www.cpso.on.ca/CPSO/media/documents/Policies/Policy-Items/Marijuana-for-Medical-Purposes.pdf?ext=.pdf

PQ
http://www.cmq.org/publications-pdf/p-1-2014-04-01-en-directives-concernant-ordonnance-cannabis-seche-fins-medicales.pdf?t=1494298536767

NB
http://www.cpsnb.org/english/Guidelines/MedicalMarijuana.htm

NS
http://www.cpsns.ns.ca/DesktopModules/Bring2mind/DMX/Download.aspx?PortalId=0&TabId=129&EntryId=52

PE
http://cpspei.ca/wp-content/uploads/2017/03/Marijuana-Prescribing-Nov-3016.pdf

NF
https://www.cpsnl.ca/web/CPSNL/Policies/Advisory_and_Interim_Guideline_-_Medical_Marihuana.aspx?WebsiteKey=5aa40243-c5bc-4d65-8700-ec72b9c7cb44
http://www.cpsnl.ca/userfiles/file/CPSNL_Medical Marihuana_March 2014 rev 1_0.pdf

Table 2 Number of individuals licensed to cultivate cannabis and number of plants authorized under the MMAR, December 2013.

Province	Number of individuals licensed to cultivate	Per 100,000 pop. 25+	Number of plants authorized	Per 100,000 pop. 25+
BC	16,010	477	1,681,829	50,129
NS	1,443	208	32,235	4,652
NB	609	110	15,160	2,733
MB	735	85	68,830	7,970
ON	7,332	76	441,878	4,580
SK	423	56	16,940	2,231
AB	1,328	47	123,492	4,365
PE	27	26	608	584
NL	76	19	2,387	609
PQ	891	15	71,291	1,198
Canada	28,886	115	2,455,566	9,736

Table 3 Number of varieties of dried cannabis for sale and median price per gram, by THC and CBD concentration, May 2017

THC, CBD concentration		number of products	% of products	median price/gram
Low CBD	THC 10-20%, CBD ≤5%	86	59%	$8.50
	THC >20%, CBD ≤5%	22	15%	$12.00
	THC 2-10%, CBD ≤5%	3	2%	$15.00
Low THC	THC ≤2%, CBD 5-15%	4	3%	$8.25
	THC ≤2%, CBD 15-25%	4	3%	$11.00
Other	THC 2-10%, CBD 5-15%	24	17%	$9.00
	THC 10-20%, CBD 5-15%	1	1%	$8.50
	THC 10-20%, CBD >25%	1	1%	$8.25
	Total	145	100	$9.00