

Rapid Synthesis

Examining the Impact of Decriminalizing or Legalizing Cannabis for Recreational Use

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Rapid Synthesis:
Examining the Impact of Decriminalizing or Legalizing Cannabis for Recreational Use
30-day response

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McMaster Health Forum and Forum+

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The Michael G. De Groote Centre for Medicinal Cannabis Research leverages McMaster University’s world-renowned expertise in health research and evidence-based medicine to advance the science of medicinal cannabis. The focus of the Centre is threefold: 1) to curate existing research toward evidence-based practice and policy; 2) to conduct cutting-edge research on the therapeutic effects and potential risks associated with cannabis; and 3) to create a network of medicinal cannabis professionals. At McMaster and in the broader scientific community, the Centre serves as a platform for critical discussions and interdisciplinary research collaborations on medicinal cannabis.

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Timeline

Rapid syntheses can be requested in a three-, 10- or 30-business day timeframe. This synthesis was prepared over a 30-business day timeframe. An overview of what can be provided and what cannot be provided in each of the different timelines is provided on the McMaster Health Forum’s Rapid Response program webpage (<http://www.mcmasterhealthforum.org/policymakers/rapid-response-program>).

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Conflict of interest

The authors declare that they have no professional or commercial interests relevant to the rapid synthesis. The funder played no role in the identification, selection, assessment, synthesis or presentation of the research evidence profiled in the rapid synthesis.

Merit review

The rapid synthesis was reviewed by a small number of policymakers, stakeholders and researchers in order to ensure its scientific rigour and system relevance.

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KEY MESSAGES

Questions

- What is known about the epidemiological consequences of decriminalization or legalization of cannabis in large catchment areas?
- How does medicinal cannabis operate in jurisdictions where recreational cannabis use has been legalized or decriminalized?

Why the issue is important

- Cannabis is currently the world's most used illicit psychoactive substance, with 2012 estimates showing that about 200 million people globally reported using it at least once.
- In 2013, despite having been prohibited since the 1920s, Canada had the highest rate of marijuana use among youth for all developed nations.
- The prosecution and enforcement of cannabis laws is resource intensive, and the results of these charges have serious implications for the individuals who are prosecuted, especially for young adults.
- To better control who has access, who is distributing and who is benefiting from the sale of cannabis, the approach to regulating it is shifting in some jurisdictions away from a prohibitive approach towards decriminalization or legalization.
- With pending policy changes in Canada at the federal level, it is timely to take stock of what is known about the impact of decriminalizing or legalizing recreational cannabis.

What we found

- We identified a total of 43 documents including five systematic reviews, six non-systematic literature reviews, one program evaluation, and 31 primary studies to inform this rapid synthesis.
- In addition to this, we also undertook a jurisdictional scan of the current legislation in 11 jurisdictions that have legalized, or are in the process of legalizing recreational cannabis, and of the 24 jurisdictions that have decriminalized, or are in the process of decriminalizing recreational cannabis.
- Generally, systematic reviews and primary studies focused on jurisdictions that have legalized or decriminalized the use of recreational cannabis have found a reduction in the perception of risk of epidemiological harms, and an increase in the use of cannabis.
- Mixed effects were found with regards to the impact of cannabis on using other substances, with findings indicating a substitutive or additive effect for the use of alcohol, largely depending on the construction of the cannabis legislation.
- One primary study indicated a reduction in mortality from opioid overdoses among states in the U.S. that have legalized medicinal cannabis, while other primary studies indicate a reduction in the rates of suicide following legalization of medicinal cannabis.
- One non-systematic review and three primary studies found increased reports of cannabis-induced visits to the emergency room, and a greater number of telephone calls to poison control centres following children's accidental ingestion of cannabis in states that had legalized or decriminalized it.
- Jurisdictions that have legalized cannabis generally permit the purchase of approximately one ounce at a time, with variation in the extent to which home growth is permitted.
- In both legalized and decriminalized environments, governments have taken a large role in licensing growers, distributors and retailers, as well as in applying taxes to the distribution and purchase of cannabis products.
- All jurisdictions reviewed have legalized the use of cannabis for medicinal purposes, but the role of physicians in prescribing cannabis or in providing evidence of a qualifying medical condition is more central in decriminalized environments than in legalized environments, despite most jurisdictions having retained separate systems (i.e., recreational or medicinal) for accessing cannabis.

QUESTIONS

- What is known about the epidemiological consequences of decriminalization or legalization of cannabis in large catchment areas?
- How does medicinal cannabis operate in jurisdictions where recreational cannabis use has been legalized or decriminalized?

WHY THE ISSUE IS IMPORTANT

Cannabis is currently the world's most used illicit psychoactive substance, with 2012 estimates showing that about 200 million people globally reported using it at least once.⁽¹⁾ In 2013, despite having been prohibited since the 1920s, Canada was the highest ranked country amongst all nations for rates of cannabis use among youth,⁽¹⁾ representing the second most used recreational drug in Canada after alcohol.⁽¹⁾

Cannabis is the most trafficked drug in the world, with the illegal drug trade in Canada alone worth approximately \$7 billion annually.⁽¹⁾ In addition, the prosecution and enforcement of cannabis laws is resource intensive, and the results of these charges have serious implications for those individuals who are prosecuted.⁽¹⁾

Cannabis has been found to have a number of potential benefits for users, including a proven reduction in nausea, levels of spasticity and pain, which is a key reason for it having been legalized for medical use in Canada and across the majority of the U.S. and European countries.⁽¹⁾ However, frequent use of the drug can also carry significant risks, such as addiction to cannabis (cannabis use disorder) and an increase in the number of accidents due to impairments in perception and psychomotor functioning. Additional risks from the regular use of cannabis are particularly important for youth during their physical and mental development, where cannabis use has been found to impair reaction time, processing speed, concentration and other cognitive and psychomotor abilities, and to pose a risk of early onset of psychotic episodes for individuals predisposed to schizophrenia.^(1;2)

In efforts to better control who has access, who is distributing and who is benefiting from the sale of cannabis, the approach in some jurisdictions to regulating its use is to shift away from a prohibitive approach towards decriminalization or legalization. Decriminalization refers to the use of cannabis for recreational purposes remaining illegal, but criminal sanctions are removed and in some cases replaced by other civil penalties such as fines. As of 2015, a total of 22 countries have adopted some form of decriminalization, but Uruguay is the only country that has legalized cannabis use at a national level.

In Canada, the federal Liberal government was elected in 2015, and an important part of its platform was to change the approach to regulating cannabis. In April 2017, a bill was introduced that would legalize

Box 1: Background to the rapid synthesis

This rapid synthesis mobilizes both global and local research evidence about a question submitted to the McMaster Health Forum's Rapid Response program. Whenever possible, the rapid synthesis summarizes research evidence drawn from systematic reviews of the research literature and occasionally from single research studies. A systematic review is a summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select and appraise research studies, and to synthesize data from the included studies. The rapid synthesis does not contain recommendations, which would have required the authors to make judgments based on their personal values and preferences.

Rapid syntheses can be requested in a three-, 10- or 30-business-day timeframe. An overview of what can be provided and what cannot be provided in each of these timelines is provided on the McMaster Health Forum's Rapid Response program webpage (<http://www.mcmasterhealthforum.org/policymakers/rapid-response-program>)

This rapid synthesis was prepared over a 30-business day timeframe and involved five steps:

- 1) submission of a question from a health system policymaker or stakeholder (in this case, McMaster University's DeGroot School of Medicine);
- 2) identifying, selecting, appraising and synthesizing relevant research evidence about the question;
- 3) drafting the rapid synthesis in such a way as to present concisely and in accessible language the research evidence; and
- 4) finalizing the rapid synthesis based on the input of at least two merit reviewers.

recreational cannabis as early as 2018. The federal government, however, has signalled an intention to keep the medical and recreational systems separate following a series of consultations with patients, where this preference was explicitly stated. In particular, concerns were expressed around accessibility, affordability and changes in potency that may result from merging the two markets. This approach differs from other jurisdictions that have legalized cannabis (e.g., Uruguay), and is also a departure from the current legal status in the U.S., where cannabis has been legalized in eight states and in the District of Columbia.(1)

With the potential for large policy changes in Canada regarding the use of cannabis, it is timely to take stock of what is known about the social impact and epidemiological consequences of decriminalizing or legalizing recreational cannabis.

WHAT WE FOUND

There have been numerous systematic reviews and studies on both the positive and negative health effects of cannabis use, which we have summarized in a previous rapid synthesis.(2) This rapid synthesis instead focuses specifically on evidence on the epidemiological and societal consequences as a result of decriminalization or legalization of cannabis.

We identified a total of 43 relevant documents by searching four databases (Health Systems Evidence, PubMed, JSTOR, and Social Science Abstracts), with the search strategy detailed in Box 2. As mentioned above, literature was included when it directly addressed one of the two questions posed for this rapid synthesis. In total, we identified 43 documents including five systematic reviews, six non-systematic literature reviews, one program evaluation, and 31 primary studies. In addition to this, we undertook a scan of the current legislation in 11 jurisdictions that have legalized, or are in the process of legalizing recreational cannabis, and of 23 jurisdictions that have decriminalized, or are in the process of decriminalizing recreational cannabis. We provide more details about each systematic review and single study in Appendix 1 and 2, respectively.

What is known about the epidemiological consequences of decriminalization or legalization of cannabis in large catchment areas?

We found a total of 43 documents including five systematic reviews, six non-systematic literature reviews, one program evaluation; and 31 primary studies. We summarize the key findings from these documents below according to: 1) perceptions of cannabis and its use; 2) prevalence of cannabis use; 3) effects on the use of other substances; 4) effects on mental health; 5) effects on the prevalence of injuries and accidents; and 6) societal impacts.

Box 2: Identification, selection and synthesis of research evidence

We identified research evidence (systematic reviews and primary studies) by searching (in April 2017) in PubMed, Health Systems Evidence, JSTOR, and Social Science Abstracts, using the search strategy: (cannabis OR marijuana) AND (legal OR legalization OR decriminalization). In all of the databases we limited our search to the past 10 years.

For the second question, we conducted a jurisdictional scan using grey literature from the Canadian Task Force for the Legalization, Regulation and Restriction of Marijuana, International Drug Policy Coalition, United Nations Office of Drug Control, Canadian Foundation for Drug Policy, Centre for Addictions and Mental Health, Harm Reduction International, and Transform, as well as from primary studies and systematic reviews found in the literature search detailed above. Searches for grey literature were conducted in April and May of 2017.

The results from the searches were assessed by one reviewer for inclusion. A document was included if it fit within the scope of the questions posed for the rapid synthesis.

For each review we included in the synthesis, we documented the focus of the review, key findings, last year the literature was searched (as an indicator of how recently it was conducted), methodological quality using the AMSTAR quality appraisal tool (see the Appendix for more detail), and the proportion of the included studies that were conducted in Canada. For primary research (if included), we documented the focus of the study, methods used, a description of the sample, the jurisdiction(s) studied, key features of the intervention, and key findings. We then used this extracted information to develop a synthesis of the key findings from the included reviews and primary studies.

Perceptions of cannabis and its use

One non-systematic literature review and two primary studies found that the decriminalization and legalization of cannabis was associated with a significant decline in the perceptions of harm of cannabis use among adolescents.(3-5) Specifically, one primary study found a higher approval rate of daily cannabis use among Grade 12 high school students in California at the time that cannabis was decriminalized, compared to their peers in other U.S. states.(5)

In addition, one primary study examined rates of intent to use cannabis if it were to be legalized.(6) The study found that white, male respondents as well as those with less than a high-school level education had the highest reports of intent to use when surveyed.(6) Further, a significant correlation was found between social cigarette smoking and intent to use cannabis.(6)

Prevalence of cannabis use

Mixed evidence was found on the impact of decriminalization and legalization on the use of cannabis, with five primary studies finding increased use and two systematic reviews and six primary studies finding no increases in the use of cannabis. Moreover, among those studies that found increased use, the findings are not conclusive. For example, the National Survey on Drug Use and Health found an increase in the prevalence of cannabis use in the past 30 days for both those aged 18 to 25 and those 26 and older.(7) Among those 18- to 25-years-old, prevalence rates have increased from 21 per cent in 2006 to 31 per cent in 2014, and rates have increased from five per cent in 2006 to 12 per cent in 2014 among those 26 and older.(7) Similarly, three primary studies found that the decriminalization of cannabis in Australia and in California led to higher participation in smoking cannabis, with estimates of absolute increases ranging from 12 to 13 per cent as compared to jurisdictions where it has not been decriminalized.(8-10) In California, from a baseline rate of 33 per cent, there was an average 25 per cent increase in the number of high-school students in Grade 12 using cannabis during the past 12 months following decriminalization.(5) In contrast, the average increase in control states in the same years was nine per cent. However, the evidence of increased cannabis use is less clear when the long-term trend is considered, given that the increased rates of use among this cohort of students was not seen among students in Grade 8 or 10 as they progressed through high school, indicating a temporary increase in prevalence of cannabis use among adolescents following decriminalization.(5) This finding is consistent with a primary study, which found an initial uptake among adolescents using cannabis in jurisdictions where it had been decriminalized, but the uptake dissipated five years following implementation.(10)

From the two systematic reviews and six primary studies that found no increase in the use of cannabis following decriminalization and legalization:

- the two systematic reviews and three of the primary studies examined the legalization of medical cannabis in the U.S., and found no increase in the use of cannabis in the broader population, but found that states which passed either decriminalization or legalization legislation typically had higher baseline rates of cannabis use compared to jurisdictions where cannabis remains prohibited;(3; 8; 11-13)
- a primary study evaluating the first year of legalized cannabis in Colorado found no significant increase in the 30-day use of cannabis among adults or high-school students;(14)
- another primary study found similar rates of lifetime use of recreational cannabis within U.S. states that had legalized recreational cannabis compared to neighbouring U.S. states which had legalized medicinal cannabis use (45 per cent in Washington and Oregon; 36 per cent and 32 per cent respectively in Colorado and New Mexico);(15) and
- another primary study also found that the legalization of medical cannabis, and its distribution through dispensaries led to an average increase in sinsemilla use (a type of high potency cannabis), which mediated an increase in the availability of higher potency cannabis in the market place (a similar trend was observed in U.S. states which had decriminalized marijuana, however it is thought that this can be counterbalanced by permitting home growth).(16)

One primary study examined the prevalence of alternative methods of cannabis use and found that in states where medical cannabis had been legalized, there was a significantly higher rate of consumption using vaporizers or edible methods.(17) Similarly, findings from the initial evaluation of legalizing cannabis in Colorado reported unexpectedly high demand for edible forms of cannabis during the first month of implementation.(18)

Several studies also examined the age of first use of cannabis. In one primary study conducted in the Czech Republic, decriminalization did not lead to a significant change in the age of first use of cannabis.(19) In addition, one primary study from the Netherlands found that distance to a shop or cannabis café significantly altered the age at which youth began to use cannabis. Specifically, youth who lived more than 20 kilometres from a municipality with a cannabis shop had a lower initial rate of cannabis use and were less likely to begin using at a younger age.(20)

Effects of cannabis use on the use of other substances

We identified two reviews and eight primary studies related to the effects of decriminalizing and legalizing cannabis on the use of alcohol,(12; 21-25) prescriptions drugs,(22; 26) opioids (27) and tobacco.(8; 13) Two reviews and four primary studies examined the effects of decriminalizing recreational cannabis and legalizing medicinal cannabis on alcohol use.(12; 21) The reviews, one systematic and one non-systematic, found mixed evidence on its impact, which could be a combined result of the purpose of use (whether for recreation or medicinal purposes) and its legal status. For example, one primary study compared the use of cannabis between recreational users and medical users in U.S. states. Where medicinal cannabis was legal, fewer medical users combined the use of cannabis with other substances as compared with recreational users.(24) In addition, another primary study found approximately 20% of recreational users regularly combined it with alcohol in U.S. states where cannabis was legal.(25)

The reviews also found that more lenient cannabis regulation resulted in a substitution effect for alcohol.(12; 21) This was demonstrated through a reduction in per capita beer sales, a decrease in total alcohol consumption, and in the total number of alcohol-related traffic fatalities.(12; 21) These findings were further supported by a single study which found a reduction in heavy drinking that was concentrated among those aged 18-29, which was combined with a 13 per cent absolute reduction in fatalities involving alcohol.(22)

Complicating these findings however, is evidence from jurisdictions that have implemented a dispensary model for distribution of cannabis as opposed to either a mail or pharmacy model. Specifically, one of the systematic reviews found that in jurisdictions where medicinal cannabis is provided through dispensaries, there has been evidence of an increase in combined alcohol and cannabis use.(21) This has been demonstrated through increases in binge drinking episodes (though no increase in the overall number of drinks), an increase in the reports on individuals using cannabis and alcohol at the same time, and an increase in alcohol-related fatalities where dispensary models are in place.(21) However, this increase in alcohol use was not found in a sub-sample analysis of those under the age of 21. This evidence suggests that the effect of cannabis on alcohol use likely depends on specific aspects of the policy implementation, including laws related to patient registry, models of product distribution, and the length of time the policy has been in place.(21)

One primary study examining the impact of changes in prescription patterns found that following the passing of legislation to legalize medicinal cannabis, states in the U.S. saw a significant reduction in the use of prescription drugs for which cannabis served as a clinical alternative.(26) Further, between 2010 and 2013 fewer prescriptions were written for anxiety, depression, nausea, pain, psychosis, seizures, sleep disorders and spasticity, a finding that is strongly correlated with the passage of medical cannabis laws.(26)

One primary study found a 25 per cent lower mean annual rate of mortality from opioid overdoses in U.S. states that had legalized medicinal cannabis, compared to those in which medicinal cannabis remained

illegal.(27) Further, the study found that this lower rate of mortality improved over time, with a 19 per cent reduction in mortality rates from opioid overdose in the first year following legalization, and a 33 per cent reduction (as compared to baseline numbers) six years following medical legalization.(27)

Finally, one primary study examined the impact of cannabis use on nicotine dependence and found that cigarette smokers who reported cannabis use in the past 30 days had higher scores on two nicotine dependence assessments as compared to cigarette smokers who indicated no cannabis use.(8) These findings held consistent across jurisdictions in which recreational cannabis was prohibited, decriminalized and legal.(8)

Effects of cannabis use on mental health

One systematic review examining the public health and safety impacts of legalizing medicinal cannabis found jurisdictions which supported the use of cannabis for therapeutic purposes had lower rates of suicide compared to jurisdictions where its use was prohibited.(12) Similarly, one primary study found a reduction in suicide rates among states in the U.S. that had legalized cannabis, with the greatest reduction observed among men aged 20 through 39.(28) One systematic review found that the use of cannabis increased the risk of psychosis compared to non-users (odds ratio = 1.41; 95% confidence interval, 1.20 – 1.65).(29) In addition, the review reported the results of one study which found that individuals who used cannabis by age 15 had a higher prevalence of schizophrenia symptoms than those who began at age 18. The study reported a baseline rate of 7.2 for those age 15 on a composite scale of 0-58 made up of measurements from self-reports and assessed psychiatric symptoms, as well as results from standardized interviews to obtain a DSM-IV diagnosis. This is compared to a baseline rate of 1.1 for those over the age of 18 on the same scale, after controlling for other drug use. The study further reports that cannabis users under the age of 15 have a higher likelihood of developing schizophreniform disorder (odds ratio =11.38, 95% confidence interval, 95% confidence interval 1.84 to 70.45) than cannabis users at age 18 (odds ratio = 1.95, 95% confidence interval 0.76 to 5.01).(30)

Effects on prevalence of injuries and accidents

One primary study found that the decriminalization of cannabis has resulted in a 52 per cent increase in emergency department visits across all states in the U.S., and a 31 per cent increase in calls made to poison control centres due to cannabis-related causes in states that had decriminalized cannabis between 2005 and 2011.(31) This is compared to states in which cannabis has not been legalized, where no change was observed during the same time period. One additional primary study supports these findings and reported a 70 per cent increase in emergency department visits with a cannabis code between 2013 and 2015 in Colorado.(20)

In addition, one systematic review and one primary study evaluated the impact of changes to cannabis regulation, and reported increases in cyclic vomiting syndrome and intoxication among children accidentally ingesting cannabis.(3; 11; 32) Specifically, the primary study reported a 63 per cent increase in calls to poison control centres for children between the ages of zero and eight. Similarly, one non-systematic review reported that the proportion of unintentional ingestions related to cannabis had increased from zero to 2.4 per cent in Colorado between 2004 and 2011.(14) One program evaluation of the legalization of cannabis in Colorado also reported increases in severe vomiting in heavy cannabis users, with one Denver-area hospital finding an increase from 0.03 per cent of all emergency department visits to 0.06 per cent. The evaluation has reported 31 instances of severe burns among adults attempting to extract THC from cannabis oils using butane during the first two years of implementation.(11)

Two primary studies and a program evaluation examined the implementation of policies legalizing recreational cannabis in Colorado and found an increase in the number of traffic fatalities where individuals tested positive for cannabis consumption, when compared with U.S. states that had not altered cannabis legislation.(11; 14; 21; 33) One of the primary studies found a 1994 baseline rate of 4.5 per cent for cannabis-positive fatal motor-vehicle accidents in Colorado, compared to a 5.9 per cent in 2009 following medicinal cannabis legalization, and a 10 per cent increase in 2011 following commercialization of cannabis.(33)

Importantly, the program evaluation notes this data does not indicate that the driver was impaired at the time of collision or at fault for the incident.(14) One primary study also found that drivers under the influence of cannabis are at double the risk of an accident compared to sober drivers.(34)

To avoid these accidents and injuries, one systematic review recommends strengthening safety policies, including requiring childproof packaging, and investing cannabis tax revenue in research to maximize health messaging.(14; 21)

Societal impacts of cannabis use

One systematic review found mixed evidence that dispensaries were positively associated with high crime rates, but the review also found that these dispensaries are often located in communities with disproportionately high crime rates prior to the dispensary opening.(12) These findings should be interpreted with caution as they are based on only four studies.(12)

One primary study compared the purchasing of cannabis in the Netherlands, where its use is de facto decriminalized (i.e., where possession of cannabis remains a crime but is not enforced), compared to San Francisco where criminalization of recreational cannabis was being enforced (at the time of study). This study found that those in San Francisco regularly purchased cannabis from friends or street dealers, whereas the respondents in the Netherlands reported obtaining their cannabis through coffee shops.(35) San Francisco respondents had a strong preference for higher potency cannabis compared to respondents from the Netherlands, and were also more likely to report that cannabis was too expensive for them to purchase.(35)

In terms of economic and fiscal impacts of legalization, one cost-benefit analysis compared a status quo policy (where cannabis would remain a criminal offence) to a regulated-legalized model in Australia, and found that when projected government revenue is included, the model found a higher net social benefit of a legalized model than the status quo.(36) In the status quo model the largest expenditure was related to criminal penalties, followed by policing costs, while for the legalized model the largest expenditure was on personal costs of licensing, followed by consumer information, and prevention and education services.(36)

How does medicinal cannabis operate in jurisdictions where recreational cannabis use has been legalized or decriminalized?

As part of the synthesis, we undertook a scan of all 36 jurisdictions that have either legalized or decriminalized cannabis use by documenting: 1) the ways in which it is regulated; 2) how it is distributed; 3) the role of the physician in attaining cannabis for medicinal purposes following recreational legalization/decriminalization; and 4) whether any coverage is available through public or private/employer-based insurance. We provide an overview below of key findings from this scan based on the more detailed content presented in Table 1 (for countries that have legalized cannabis use) and Table 2 (for countries that have decriminalized cannabis use).

Jurisdictions that have legalized cannabis

The 11 jurisdictions that have legalized recreational cannabis have generally followed a similar model of legalization by restricting the amount of possession at any one time to about 1 ounce or 28 grams.(1; 23; 37-52) In the case of Uruguay, this amount has been further divided to limit individuals to 10 grams each week.(37-40) Most jurisdictions allow for home growth of cannabis, with the exception of Washington State, where no home growth is permitted, and Nevada where home growth is permitted if an individual lives more than 25 miles from a dispensary.(39; 46; 51) The remaining jurisdictions vary in the number of plants they allow, ranging from four to 12, but most states have capped the number of mature plants (flowering) at three.(39; 41-43; 46-48; 52) Most jurisdictions have restricted the use of cannabis to private homes, and occasionally social clubs (Uruguay), with the public use of cannabis resulting in a civil fine. To contend with the challenging politics of legalization, most jurisdictions and U.S. states, including Canada (which has

proposed legislation) allow municipalities or provinces to opt out of permitting any distributors or retailers to operate within select areas.(37-43)

In terms of distribution, licensing is required in all jurisdictions (except Washington, D.C., where large-scale cultivation is not currently permitted) to cultivate cannabis for retail purposes, act as a distributor or become a retailer, with some jurisdictions having additional restrictions on the size of the plot that can be developed, the amount of cannabis cultivated and how much can be stored at any given retail location.(23; 37-51) All jurisdictions have regulations against advertising with the aim of reducing marketing to children. All U.S. states have restricted the location of where cannabis retail locations can be placed, particularly in relation to schools and community centres. In all jurisdictions, an excise tax (a fixed amount or percentage), has been placed on cannabis for recreational use. However, in many U.S. states this tax is waived when purchasing with a physician's recommendation.(23; 39; 41-48; 50-52) Interestingly, the price of obtaining cannabis has been set purposely low in Uruguay to incentivize individuals to purchase through legal means rather than the black market.(37-40)

Unlike the regulation and distribution of recreational cannabis, the way in which medical cannabis is integrated into the legal regulations varies between jurisdictions. In Uruguay, physicians can prescribe medicinal cannabis which may affect access to derivative products, but regulations around quantity of personal possession are the same for both medicinal and recreational purposes.(37-40) As previously mentioned, the federal government in Canada has proposed maintaining a separate system for access to medicinal cannabis.(1) This decision is a result of both allowing provinces to set different regulations for access as well as to address patient concerns around access, affordability (e.g., changes in taxes and additional tariffs) and potency as a result of merging the two markets.(1)

In contrast, the U.S. remains in a grey zone, whereby physicians are unable to prescribe medicinal cannabis as it remains a federally-controlled substance. However, following the passage of the Compassionate Use Act in California in 1997 and a series of federal court challenges following it, patients in select states where medicinal cannabis is legal are allowed to use cannabis for medicinal purposes upon the recommendation or approval of a physician. Where recreational cannabis is legal, patients with physician approval may purchase from a dispensary and in most cases are relieved of taxes on the drug.(23; 39; 41-54) However, no insurance coverage is provided for medicinal cannabis, but three products (Marinol, Cesamet and Syndros) that are derived from cannabis have received FDA approval for the treatment of nausea in chemotherapy patients, treatment of acute epilepsy in children, and treatment of anorexia associated with weight loss in AIDS patients.(55)

In Canada, the Task Force on Cannabis Legalization and Regulation has recommended maintaining a separate system for medical cannabis, where a physician prescription would be required.(1) Currently, medical cannabis is not covered by provincial health insurance plans, but there is coverage for select derivatives from public drug programs such as the coverage of Nabilone for the treatment of nausea among cancer patients under the Ontario Public Drug Program.(56)

Table 1: Comparison of cannabis regulation in jurisdictions that have legalized recreational use

Jurisdiction	Regulation	Distribution	Role of physician	Insurance funding
Canada (expected 2018)	<ul style="list-style-type: none"> Individuals over the age of 18 can possess up to 30 grams of cannabis in public spaces, with potential regional variation on age Home growth permitted of up to four plants Separate medical access with associated registry for users has been recommended (1) 	<ul style="list-style-type: none"> Provinces and territories will license, authorize, and oversee the distribution of cannabis In the absence of regional regulatory frameworks, federally licensed producers can provide retail thorough secure home delivery Seed-to-sale tracking has been recommended Sale of medical and non-medical cannabis subject to GST of five per cent, plus potential additional excise taxes recommended Limited store frontage, restricted site placement, and mail-order capability has been recommended (1) 	<ul style="list-style-type: none"> Physicians continue to prescribe for the purpose of medical cannabis It has been recommended that a separate system be maintained between recreational and medical use Patients may qualify for a medical prescription so long as a healthcare practitioner has documented the benefits and risks and has provided a medical document detailing the amount and length of use (1; 57) 	<ul style="list-style-type: none"> Coverage for select cannabis derivatives from provincial public drug programs Select coverage for medical cannabis and derivatives from private/employer-based insurance (56)
Uruguay	<ul style="list-style-type: none"> Individuals over the age of 18 can purchase up to 10 grams per week with or without a prescription Individuals wishing to access cannabis must register with the Institute for Regulation and Control of Cannabis (IRCC) Individuals can grow up to six plants for personal consumption, so long as the plant(s) have been registered with the IRCC and they do not produce over 480 grams (37-40) 	<ul style="list-style-type: none"> Two private companies have been licensed to cultivate roughly two tons of cannabis annually Companies must bid for production contracts Distribution and packaging is handled by these same entities and is sent directly from the location of production to registered pharmacies Sale of cannabis is subject to value-added taxes, but is exempt from taxes on agricultural goods Fixed buying price of cannabis determined by government to compete with black market (37-40) 	<ul style="list-style-type: none"> Physicians are able to prescribe the use of cannabis to patients, but medical cannabis adheres to the same regulations placed on personal consumption (37-40) 	<ul style="list-style-type: none"> No public coverage for medical usage (37-40)
Alaska, U.S.	<ul style="list-style-type: none"> Individuals over the age of 21 can purchase and possess up to 28 grams of usable cannabis, with varying restrictions on possession levels of cannabis-infused products No public consumption is allowed Home growth permitted of six plants, with three mature plants at any one time 	<ul style="list-style-type: none"> Licensing required with the Liquor Control Board annually for cultivation and retail facilities Retailers not permitted within 500 feet of schools, religious buildings, correctional facilities or recreation centres, or within liquor retailer premises Sale subjected to excise tax of \$50 per ounce (41-43) 	<ul style="list-style-type: none"> Physicians not able to prescribe due to federal legislation and are not required to recommend for medical use Physicians not required to discuss benefits and risks of cannabis usage with patients (41-43) Medicinal prescriptions may be written for patients with any of the 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (41-43)

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	<ul style="list-style-type: none"> • Permitted to gift up to 28 grams of cannabis to another adult over the age of 21 • Municipalities may opt out and have control over the number of businesses allowed within their limits (41-43) 		<p>following conditions: cancer; glaucoma; and HIV or AIDS</p> <ul style="list-style-type: none"> • Or any of the following symptoms: cachexia; severe pain; severe nausea; seizures; or persistent muscle spasms (58) 	
California, U.S.	<ul style="list-style-type: none"> • Individuals over the age of 21 can purchase and possess up to 28 grams for personal possession with varying restrictions on possession levels for cannabis-infused products • Home growth permitted of six plants • No use in open and public spaces • Municipalities can opt out (44; 45) 	<ul style="list-style-type: none"> • Licensing required for cultivation facilities, retail and medical dispensaries • Retailers not permitted within 600 feet of schools or recreation centres • Seed-to-sale tracking required • Sale subjected to standard sales tax, 15% excise tax, and cultivation tax of \$9.25 levied per ounce for flowers and \$2.75 per ounce for leaves (medical cannabis exempt from sales tax with physician recommendation) (44; 45) 	<ul style="list-style-type: none"> • Physicians not able to prescribe due to federal legislation, but may provide recommendation for medical use (44; 45) • Medicinal recommendations may be written for patients with any of the following conditions: AIDS; anorexia; arthritis; cancer; glaucoma; and multiple sclerosis • Or any of the following symptoms: cachexia; chronic pain; migraine; persistent muscle spasms; seizures; and severe nausea (59) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (44; 45)
Colorado, U.S.	<ul style="list-style-type: none"> • Individual state residents (>2 years) over the age of 21 can purchase and possess up to 28.5 grams for personal possession. Non-state residents can purchase 7.12 grams. • Home growth permitted of six plants, with three flowering at any time • Sale subjected to standard sales tax, 15% excise tax on cultivator and a 10% special sales tax (medical cannabis exempt) • No use in open and public spaces, subject to \$100 fine and 24 hours of community service • Municipalities can opt out (39; 46-48) 	<ul style="list-style-type: none"> • Licence required for cultivation facilities and retail dispensaries • Advertising restricted to avoid reaching minors • Health effect warnings and child resistant packaging required • Medical cannabis usage requires registration • Large, for-profit companies permitted • Seed-to-sale tracking required (39; 46-48) 	<ul style="list-style-type: none"> • Physicians not able to prescribe due to federal legislation, but may provide recommendation for medical use (39; 46-48) • Medicinal recommendations may be written for patients with any of the following conditions: cancer; glaucoma; HIV or AIDS; and post-traumatic stress disorder • Or any of the following symptoms: cachexia; persistent muscle spasms; seizures; severe nausea; and severe pain (60) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (39; 46-48)
Oregon, U.S.	<ul style="list-style-type: none"> • Individuals over the age of 21 can purchase and possess up to 28.5 grams for personal possession or 680 grams for medical usage with varying restrictions on possession levels for cannabis-infused products • Home growth permitted of four plants • Sale subjected to standard sales tax, plus 3% local tax (medical cannabis 	<ul style="list-style-type: none"> • Licensing required for cultivation facilities, retailers and laboratories • Advertising restricted to avoid reaching minors • Health effect warnings and child resistant packaging required • Seed-to-sale tracking required via UID tags which must be purchased for plants >24 inches in height from one exclusive company 	<ul style="list-style-type: none"> • Physicians not able to prescribe due to federal legislation, but may provide recommendation for medical use (49) • Medicinal recommendations may be written for patients with any of the following conditions: cancer; glaucoma; degenerative neurological conditions; HIV or AIDS; or post-traumatic stress disorders 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (49)

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	<ul style="list-style-type: none"> exempt from sales tax with physician recommendation) No use in open and public spaces Municipalities can opt out (49) 	<ul style="list-style-type: none"> Medical processing facilities cannot be co-located with recreational processing facilities (49) 	<ul style="list-style-type: none"> Or any of the following symptoms: cachexia; severe pain; severe nausea; seizures; persistent muscle spasms (61) 	
Maine, U.S.	<ul style="list-style-type: none"> Individuals over the age of 21 can purchase and possess as much as 71 grams for personal possession Home growth permitted of up to six flowering plants, 12 immature plants and unlimited seedlings per residence Law prohibits the giving, administering, or transferring of cannabis to others (23; 50) 	<ul style="list-style-type: none"> Annual licensing required for cultivation facilities, retailers and laboratories Maximum cultivation plot is 800,000 ft² statewide Seed-to-sale tracking required Sale subjected to standard sales tax, 10% excise tax (medical usage exempt from sales tax with physician recommendation) (23; 50) 	<ul style="list-style-type: none"> Physicians not able to prescribe due to federal legislation, but may provide recommendation for medical use to support application for medical-use card (23; 50) Medicinal recommendations may be written for patients with any of the following conditions: Alzheimer's disease; cancer; glaucoma; HIV or AIDS; hepatitis C; amyotrophic lateral sclerosis; Crohn's disease; nail-patella syndrome Or any of the following symptoms: cachexia; severe nausea; seizures; and persistent muscle spasms 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (23; 50)
Massachusetts, U.S.	<ul style="list-style-type: none"> Individuals over the age of 21 can purchase and possess up to 28 grams for personal possession Home growth permitted of up to 12 plants per household (51) 	<ul style="list-style-type: none"> Annual licensing required for cultivation facilities, retailers and laboratories No more than 75 each of retailers, manufacturers and cultivators will be licensed in the state Retailers not permitted within 500 feet of schools Sale subjected to standard sales tax, 3.75% excise tax, 2% local tax (51) 	<ul style="list-style-type: none"> Physicians not able to prescribe due to federal legislation, but may provide recommendation for medical use to support application for medical-use card (54) Medicinal recommendations may be written for patients with any of the following conditions: cancer; glaucoma; HIV or AIDS; hepatitis C; amyotrophic lateral sclerosis; Crohn's disease; Parkinson's disease; and multiple sclerosis Or any of the following symptoms: cachexia or wasting syndrome; intractable pain; and nausea (62) 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (54)
Nevada, U.S.	<ul style="list-style-type: none"> Individuals over the age of 21 can purchase and possess up to 28 grams for personal possession No home growth unless living more than 25 miles away from nearest dispensary, in which case six plants can be grown per household Municipalities able to opt out (63) 	<ul style="list-style-type: none"> Annual licensing required for cultivation facilities, retailers and laboratories Number of licences will be restricted at the county level depending on population No delivery permitted Retailers not permitted within 1,000 feet of school or 300 feet of community centres Sale subjected to 15% excise tax (63) 	<ul style="list-style-type: none"> Physicians not able to prescribe due to federal legislation, but are required to provide 'physician statement' to support application for medical-use card (63) Medicinal recommendations may be written for patients with any of the following conditions: AIDS; cancer; glaucoma; and post-traumatic stress disorder 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (63)

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			<ul style="list-style-type: none"> • Or any of the following symptoms: cachexia; persistent muscle spasms; seizures; severe nausea; and severe pain (64) 	
Washington, U.S.	<ul style="list-style-type: none"> • Individuals over the age of 21 can purchase and possess up to 28 grams of usable cannabis, with varying restrictions on possession levels for cannabis-infused products • No home growth permitted • Cannabis licences granted to individual state residents (>3 months) • Criminal background checks required for those who hold licences • No use permitted in view of general public, subject to \$50 civil fine (39; 46) 	<ul style="list-style-type: none"> • Licence required for cannabis producers, processors and retailers • Maximum cultivation is 2 million ft² statewide • One producer, processor, or regulator is only allowed to hold a market share of up to 33% of the permitted licences in a county or city area • Sale subjected to 25% excise tax at each stage of supply chain as well as normal sales tax (39; 46) 	<ul style="list-style-type: none"> • Physicians provide diagnosis of debilitating medical condition and provide written documentation that they would 'benefit from' or that 'potential benefits likely outweigh health risks' of cannabis usage • Physicians not required to discuss benefits and risks of cannabis usage with patients (53) • Medicinal recommendations may be written for patients with any of the following conditions: anorexia; cancer; Crohn's disease; epilepsy; glaucoma; hepatitis C; HIV; multiple sclerosis; post-traumatic brain disorder; spasticity; traumatic brain injury (65) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (53)
Washington, D.C., U.S.	<ul style="list-style-type: none"> • Individuals over the age of 21 can possess up to 56 grams of cannabis for personal use • Home growth is permitted of up to six cannabis plants with a maximum of three mature plants per principal residence • Smoking is outlawed in all public spaces including inside private clubs, bars, hotels and restaurants (52) 	<ul style="list-style-type: none"> • The District of Columbia has not permitted the production of cannabis through licensed commercial growers (52) 	<ul style="list-style-type: none"> • Physicians provide a recommendation for the use of cannabis which entitles individuals to a medical cannabis card (52) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (52)

Jurisdictions that have decriminalized cannabis

In addition to examining the regulation, distribution and integration of medical cannabis in legalized environments, we also looked at current legislation in 23 decriminalized jurisdictions. In choosing jurisdictions, we only included those that had decriminalized cannabis (or recently passed legislation to decriminalize), but had also legalized the use of medical cannabis. There are a number of European and South and Central American countries that have decriminalized the possession of small amounts of cannabis, but do not currently permit the use of medical cannabis, likely as an effort to redistribute justice resources away from small drug offences.

Generally, jurisdictions that have decriminalized recreational cannabis have removed criminal sanctions for small amounts (five to 56 grams) of cannabis possession for personal use.(12; 15; 40; 66-99) Instead, many jurisdictions have implemented civil fines whereby a ticket is issued for possession or use of cannabis in a public space, and individuals are required to pay the fine to either the municipal, state or federal government. More elaborate civil proceedings have been developed in select jurisdictions, such as in Israel where first time offenders are not charged under the criminal code, or in Portugal where, rather than being prosecuted criminally, individuals are required to attend a ‘drug court’ or ‘dissuasion committee’ where proceedings focus on public health and may recommend treatment for an individual.(12; 73-75; 85; 86)

Jurisdictions differ on whether criminal sanctions exist for the home growth of cannabis, with select jurisdictions allowing up to 12 plants before criminal charges can be laid, while others permit the home growth of cannabis for medicinal purposes.(12; 80-82; 85;86; 94)

In terms of distribution of medical cannabis, most jurisdictions require that the government license suppliers or that they import products from other countries, with a designated ministry or government agency overseeing any cultivation, production and retail.(12; 15; 40; 66-70; 73-75; 78-86; 89-92; 94; 97; 98; 100-101)

Either a physician prescription or application for a medical cannabis licence, whereby individuals’ names and information are held in a registry, is required in all jurisdictions included in Table 2. Medical cannabis licences are typically only provided for select medical conditions, but jurisdictions range in the severity of conditions permitted. Most commonly, individuals meeting these criteria and holding a medical cannabis licence are provided access to synthetics or cannabis derivatives. Very few jurisdictions provide insurance coverage for medical cannabis, with Poland and Switzerland providing coverage in a similar manner to other pharmaceuticals.(40; 77) Select U.S. states have also implemented a reduced price for individuals requiring medical cannabis who are of low socio-economic status.(66; 90; 95; 97; 102)

Table 2. Comparison of cannabis regulation in jurisdictions that have decriminalized recreational use

Jurisdiction	Regulation	Distribution	Role of physician	Insurance funding
Australia (legislation differs by states)	<ul style="list-style-type: none"> Individuals not prosecuted for possession under 10 grams in most territories, with varying regulations No cultivation permitted Medical use permitted (40; 89-91) 	<ul style="list-style-type: none"> Licensed commercial production permitted for medical purposes Import permitted until domestic production meets need Import licence and prescription required to import (40; 89-91) 	<ul style="list-style-type: none"> Physician prescription required for patients with painful or chronic conditions No specific conditions have been set for which physicians are able to prescribe medicinal cannabis, however applications can be submitted for any “debilitating medical condition that may potentially be amenable to treatment with medicinal cannabis” (90; 103) 	<ul style="list-style-type: none"> Some private insurance covers select synthetic derivatives (90)
Austria	<ul style="list-style-type: none"> Individuals not prosecuted for possession under five grams No home growth permitted Medical use permitted (74) 	<ul style="list-style-type: none"> Agency for Health and Nutrition Safety responsible for medical cultivation No explicit regulations for cultivation Synthetic derivatives available domestically and for import (74) 	<ul style="list-style-type: none"> No explicit direction stated since January 2016 legislative change (74) 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (74)
Belgium	<ul style="list-style-type: none"> Individuals are not prosecuted for possession under three grams or one female plant Medical use permitted (100; 101) 	<ul style="list-style-type: none"> Synthetic derivatives available for import (100; 101) 	<ul style="list-style-type: none"> Physician prescription required with attachment to university hospital in the use of clinical research (100; 101) 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (100; 101)
Chile	<ul style="list-style-type: none"> Individuals are not prosecuted for possession for ‘personal use’ Regulation for home growth currently in transition Medical use permitted (88) 	<ul style="list-style-type: none"> Medical cannabis produced at a single legal plantation (92) 	<ul style="list-style-type: none"> Physician prescription required (88) 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (88)
Croatia	<ul style="list-style-type: none"> Individuals are not prosecuted for possession of ‘small quantities’ Individuals proposed to be able to possess 0.75 grams of THC per month for medical purposes (87) 	<ul style="list-style-type: none"> Agency for Medicinal Products and Medical Devices regulates licensing of companies engaged in cannabinoid oil sale and distribution (87) 	<ul style="list-style-type: none"> Physician prescription required Prescriptions may be written for individuals with any of the following conditions: HIV or AIDS; cancer; and multiple sclerosis (87) 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (87)
Germany	<ul style="list-style-type: none"> Individuals are not prosecuted for possession of up to five grams, with regional variability, for personal use Medical use permitted for seriously ill patients No usage in public space (87) 	<ul style="list-style-type: none"> Federal Institute for Drugs and Medical Devices regulate licence for pharmaceutical retail No cultivation permitted (87) 	<ul style="list-style-type: none"> Physician prescription required for those with serious illness and no therapeutic alternative (87) 	<ul style="list-style-type: none"> No insurance coverage for medical cannabis (87)
Israel	<ul style="list-style-type: none"> Individual first-time offenders not prosecuted for possession under 15 grams 	<ul style="list-style-type: none"> Government is responsible for licensing producing, laboratories and companies that transport the good, as well as 	<ul style="list-style-type: none"> Specialist-physician recommendation required for those with particular illnesses 	<ul style="list-style-type: none"> Flat rate of 37 USD when purchasing medical cannabis, for licence-holders, regardless of amount purchased (102)

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	<ul style="list-style-type: none"> • Home growth permitted of up to five plants for medical purposes • Medical usage permitted (12; 85; 86) 	<p>dispensaries and (eventually) pharmacies that will fill medical cannabis for licensed patients (12; 85; 86)</p>	<ul style="list-style-type: none"> • Prescriptions may be written for individuals with any of the following conditions: AIDS; cancer; Crohn's disease; multiple sclerosis; Parkinson's disease; post-traumatic stress disorder; Tourette Syndrome • State of Israel Ministry of Health reviews physician recommendations and provides permits to patients to purchase directly from licensed suppliers (102) 	
Italy	<ul style="list-style-type: none"> • Individuals not criminally prosecuted for personal use • No home growth permitted (83; 84) 	<ul style="list-style-type: none"> • Italian Army responsible for medical production and distribution of 100 kg/year • Direct distribution to pharmacies for retail • Price of medical cannabis is kept below estimated street value to combat use of the black market for access (83; 84) 	<ul style="list-style-type: none"> • Physician prescription required • Prescriptions may be written for pain relief to patients with cancer or multiple sclerosis (83; 84; 104) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (83; 84)
Jamaica	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 56 grams • Home growth of up to five plants permitted for medical purposes • Medical use permitted • Non-residents can apply for permits authorizing small amounts for purchase for medical use • Religious usage permitted without restriction in place of worship (80-82) 	<ul style="list-style-type: none"> • Currently three companies licensed for cultivation by Cannabis Licensing Authority • No retail authorities currently licensed (80-82) 	<ul style="list-style-type: none"> • Physician consult and provide a prescription, or in some instances 'self-declaration' of medical need is required • Prescriptions may be written for any person suffering from cancer, a terminal illness or a serious chronic illness for which there has been a shown therapeutic benefit of cannabis use (80-82; 105) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (80-82)
Mexico (expected)	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under five grams • No home growth permitted • Medical use permitted (25; 106) 	<ul style="list-style-type: none"> • Ministry of Health regulates licences for cultivation for medicinal or scientific purposes of strains with less than 1% tetrahydrocannabinol (15; 106) 	<ul style="list-style-type: none"> • No explicit direction stated since April 2017 legislative change (25; 106) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (25; 106)
Netherlands	<ul style="list-style-type: none"> • Individuals over the age of 18 are permitted to possess up to five grams for personal usage • Home growth in terms of small-scale cultivation for private consumption permitted • Usage permitted in publicly open 'coffee shops' (15; 40) 	<ul style="list-style-type: none"> • 'Coffee-shop' regulation set by municipalities • Retail sales with maximum stock retained of 500 grams permitted • No commercial production • Ministry of Health, Welfare, and Sport regulates single supplier for pharmaceutical-grade retail (15; 40) 	<ul style="list-style-type: none"> • Physician prescription required for those with particular illnesses to access medical cannabis from retail pharmacies (15; 40) • Prescriptions may be written for the following debilitating symptoms: long-term neurogenic pain; muscle spasms; nausea; repetitive tics associated with Tourette Syndrome; reduced appetite; pain; vomiting; weight loss associated with cancer or AIDS (107) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis(15; 40) •

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Paraguay	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 10 grams • No home growth permitted (78; 79) 	<ul style="list-style-type: none"> • Single licence for import issued for medical use (78; 79) 	<ul style="list-style-type: none"> • Consultation with specialist-physician associated with Social Welfare and Public Health Ministry status-quo for import licence (78; 79) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (78; 79)
Poland	<ul style="list-style-type: none"> • Prosecutors are given the option of not pressing charges for the possession of small quantities of cannabis for personal use, if it is a first offence, or if the individual is drug dependent • No home growth permitted • Medical use of synthetic derivatives permitted (76; 77) 	<ul style="list-style-type: none"> • Synthetic derivatives available for import from the Netherlands on a patient-by-patient basis (76; 77) 	<ul style="list-style-type: none"> • Physician prescription required for import of derivatives • Prescriptions may be written for nausea caused by cancer treatments and for drug-resistant epilepsy (76; 77; 107) 	<ul style="list-style-type: none"> • Full refund available for medical usage of synthetic derivatives (76; 77)
Portugal	<ul style="list-style-type: none"> • Individuals are not prosecuted for possession of up to 25 grams for personal use • No home growth permitted • Medical use of synthetic derivatives permitted (73-75) 	<ul style="list-style-type: none"> • Retail not permitted • Synthetic derivatives available • Single licence for cultivation of medical-grade product for export (73-75) 	<ul style="list-style-type: none"> • Medical usage of derivatives by physician prescription • No clear regulation of medical cannabis (73-75) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (73-75)
Slovenia	<ul style="list-style-type: none"> • Individuals may not be prosecuted for possession of ‘small amounts’ for ‘one-off personal use’ • Cultivation of strains with higher than two per cent tetrahydrocannabinol content not permitted • Medical use of synthetic derivatives permitted (71; 72) 	<ul style="list-style-type: none"> • Retail of cannabis is not permitted (71; 72) 	<ul style="list-style-type: none"> • Physician prescription required for synthetic derivatives • Prescriptions may be written for nausea caused by cancer treatments and for drug-resistant epilepsy (71; 72) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (71; 72)
Switzerland	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 10 grams • No home growth permitted • Medical use of synthetic derivatives permitted (40; 108) 	<ul style="list-style-type: none"> • Retail not permitted (40) 	<ul style="list-style-type: none"> • Physician prescription required for synthetic derivatives • Prescriptions may be written for nausea caused by cancer treatments and for drug-resistant epilepsy (40) 	<ul style="list-style-type: none"> • Reimbursement for synthetic derivatives when prescribed by a physician • Usual co-payment for pharmaceuticals (approximately 30%) applies (40)
Connecticut, U.S.	<ul style="list-style-type: none"> • Individuals not prosecuted for first-time offence of possession under 14 grams for personal use • Medical usage permitted • Licensed individual card-holding medical users may possess up to 85 grams • No home growth permitted • No use in open and public spaces (70) 	<ul style="list-style-type: none"> • Annual licensing required for cultivation facilities and medical dispensaries • Number of licences restricted by Department of Consumer Protection • Municipalities can regulate dispensary sites, but cannot opt out • Individuals required to pay for personal certificate and be listed in state registry (70) 	<ul style="list-style-type: none"> • Physician recommendation required for specific conditions to obtain a Medical Cannabis Certificate (70) • Medicinal recommendations may be written for patients with any of the following conditions: amyolateral sclerosis; cancer; cerebral palsy; cystic fibrosis; Crohn’s disease; glaucoma; epilepsy; HIV or AIDS; multiple sclerosis; Parkinson’s disease; post-traumatic stress disorder; post laminectomy syndrome; psoriasis; sickle cell disease; uncontrolled intractable seizure disorder; terminal illness (109) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (70)

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<p>Delaware, U.S.</p>	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 28 grams for personal use • Medical usage permitted • Licensed individual card-holding medical users may possess up to 198 grams and obtain 84 grams of processes cannabis every two weeks • No home growth permitted • No use in open and public spaces (68; 69) 	<ul style="list-style-type: none"> • Biennial licensing required for cultivation facilities and dispensaries by Department of Health and Social Services • Dispensaries not permitted within 1,000 feet of schools • Municipalities can regulate dispensary sites • Individuals required to pay for personal 'card' and be listed in state registry (68; 69) 	<ul style="list-style-type: none"> • Physician recommendation required for application for a card (68; 69) • Medicinal recommendations may be written for patients with any of the following conditions: Alzheimer's disease; amyotrophic lateral sclerosis; autism with self-injurious or aggressive behaviour; cancer; epilepsy; HIV or AIDS; post-traumatic stress disorder; and terminal illness • Or any of the following symptoms: cachexia; chronic or debilitating pain; muscle spasms; nausea; and seizures (110) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (68; 69)
<p>Illinois, U.S.</p>	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 10 grams for personal use • Medical usage permitted • Licensed individual card-holding medical users may possess up to 85 grams • No home growth permitted • No use in open and public spaces (66; 67) 	<ul style="list-style-type: none"> • Licensing required for cultivation facilities and dispensaries • Number of licences restricted by Department of Public Health • Dispensaries not permitted within 1,000 feet of schools, child-care centres, residential districts, or group care homes • Municipalities can regulate dispensary sites • Cultivation subjected to 7% excise tax • Individuals required to pay for personal 'card' and be listed in state registry (66; 67) 	<ul style="list-style-type: none"> • Physician recommendation required for application for a card • Medicinal recommendations may be written for patients with any of the following conditions: Alzheimer's disease; HIV or AIDS; amyotrophic lateral sclerosis; Arnold-Chiari malformation; cancer; causalgia; chronic inflammatory demyelinating polyneuropathy; Crohn's disease; dystonia; epilepsy; fibrous dysplasia; glaucoma; hepatitis C; hydrocephalus; hydromyelia; interstitial cystitis; lupus; multiple sclerosis; muscular dystrophy; myasthenia gravis; myoclonus; nail-patella syndrome; neurofibromatosis; Parkinson's disease; post-traumatic stress disorder; reflex sympathetic dystrophy; residual limb pain; rheumatoid arthritis; Sjogren's syndrome; spinal cord disease; spinocerebellar ataxia; syringomyelia; and Tourette Syndrome (66; 67; 111) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis • State subsidy provided for low-income individuals (66; 67)
<p>Maryland, U.S.</p>	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 10 grams for personal use • Medical usage permitted • Licensed individual card-holding medical users may possess up to 120 grams • No home growth permitted • No use in open and public spaces (98; 99) 	<ul style="list-style-type: none"> • Quadrennial licensing required for cultivation facilities and dispensaries • Number of cultivation licences restricted to 94 by Medical Cannabis Commission • 102 licences have been pre-approved for dispensaries but none are currently in operation • Individuals required to pay for personal 'card' and be listed in state registry (98; 99) 	<ul style="list-style-type: none"> • Physician recommendation required for application for a card (98; 99) • Medicinal recommendations may be written for patients with any of the following conditions: <ul style="list-style-type: none"> ○ Or any of the following symptoms: anorexia; cachexia; chronic pain; muscle spasms; nausea; and seizures (112) 	<ul style="list-style-type: none"> • No insurance coverage for medical cannabis (98; 99)
<p>Minnesota, U.S.</p>	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 42.5 grams for personal use 	<ul style="list-style-type: none"> • Biennial licensing required for cultivation facilities and dispensaries 	<ul style="list-style-type: none"> • Physician recommendation required for application for a card (97) 	<ul style="list-style-type: none"> • No insurance coverage for medicinal cannabis

Examining the Impact of Decriminalizing or Legalizing Cannabis for Recreational Use

	<ul style="list-style-type: none"> • Medical usage permitted • No home growth permitted (97) 	<ul style="list-style-type: none"> • Restriction to only allow two manufacturers that are each allowed up to four distribution centres for product to be sold to dispensaries • Dispensaries not permitted within 1,000 feet of schools • Municipalities can regulate dispensary sites, but cannot opt out • Only available in forms that do not require dried plant matter • Individuals required to pay for personal 'card' and be listed in state registry (97) 	<ul style="list-style-type: none"> • Medicinal recommendations may be written for patients with any of the following conditions: amyotrophic lateral sclerosis; cancer; glaucoma; HIV or AIDS; inflammatory bowel disease; Tourette Syndrome; post-traumatic stress disorder <ul style="list-style-type: none"> ○ Or for any of the following symptoms: intractable pain; seizures; severe and persistent muscle spasms; terminal illness (113) 	<ul style="list-style-type: none"> • State subsidy provided for low-income individuals via fee waivers (97) •
New York, U.S.	<ul style="list-style-type: none"> • Individuals are not prosecuted for possession under 25 grams for personal use for first two offences • Medical usage permitted • Licensed individual card-holding medical users may possess up to 30-day supply of non-smokeable preparations • No home growth permitted • No use in open and public spaces (95; 96) 	<ul style="list-style-type: none"> • Biennial licensing fee required for cultivation and facilities and dispensaries • Number of licences restricted to five authorized producers to host a total of 20 dispensaries by Department of Health • Dispensaries not permitted within 1,000 feet of schools and churches • Individuals required to pay for personal 'card' and be listed in state registry (95; 96) 	<ul style="list-style-type: none"> • Registered-physician recommendation required for application for a card (95; 96) • Medicinal recommendations may be written for patients with any of the following conditions: amyotrophic lateral sclerosis; cancer; epilepsy; HIV or AIDS; Huntington's disease; inflammatory bowel disease; multiple sclerosis; Parkinson's disease <ul style="list-style-type: none"> ○ Or any of the following symptoms: cachexia; chronic pain; nausea; nervous system damage; seizures; and severe muscle spasms (114) 	<ul style="list-style-type: none"> • No insurance coverage for medicinal cannabis • State subsidy provided for low-income individuals via fee waivers (95; 96)
Rhodes Island, U.S.	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 28 grams for personal use • Medical usage permitted • Licensed individual card-holding medical users may possess up to 85 grams • Home growth of up to 12 plants and 12 seedlings for those with a medical cannabis card • No use in open and public spaces (94) 	<ul style="list-style-type: none"> • Annual licensing fee required for 'compassion centres' • Number of licensed dispensaries restricted to three 'compassion centres' by Department of Health • 'Compassion centres' not permitted within 1,000 feet of schools • Municipalities can regulate dispensary sites • Individuals required to pay for personal 'card' and be listed in state registry • Seed-to-sale tracking required (94) 	<ul style="list-style-type: none"> • Physician recommendation required to obtain medical cannabis card (94) • Medicinal recommendations may be written for patients with any of the following conditions: Alzheimer's disease cancer; glaucoma; HIV or AIDS; and hepatitis C <ul style="list-style-type: none"> ○ Or any of the following symptoms: cachexia; chronic pain; muscle spasms; nausea; and seizures (115) 	<ul style="list-style-type: none"> • No insurance coverage for medicinal cannabis (94)

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<p>Vermont, U.S.</p>	<ul style="list-style-type: none"> • Individuals not prosecuted for possession under 28 grams for personal use • Medical usage permitted • Licensed individual card-holding medical user may possess up to 85 grams • Home growth of one-to-10 plants permitted • No use in open and public spaces (92; 93) 	<ul style="list-style-type: none"> • Annual licensing fee required for cultivation facilities and dispensaries • Number of licences restricted to four by Department of Public Safety • Dispensaries not permitted within 1,000 feet of schools or child-care centres • Municipalities can regulate dispensary sites • Individuals required to pay for personal 'card' and be listed in state registry (92; 93) 	<ul style="list-style-type: none"> • Physician recommendation required for specific conditions with no therapeutic alternative (92; 93) • Medicinal recommendations may be written for patients with any of the following conditions: cancer; HIV or AIDS; glaucoma; and multiple sclerosis <ul style="list-style-type: none"> ○ Or for any of the following symptoms: cachexia; chronic pain; severe nausea; and seizures (116) 	<ul style="list-style-type: none"> • No insurance coverage for medicinal cannabis (92; 93)
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APPENDICES

The following tables provide detailed information about the systematic reviews and primary studies identified in the rapid synthesis. The ensuing information was extracted from the following sources:

- systematic reviews - the focus of the review, key findings, last year the literature was searched, the proportion of studies conducted in Canada; and
- primary studies - the focus of the study, methods used, study sample, jurisdiction studied, key features of the intervention and the study findings (based on the outcomes reported in the study).

For the appendix table providing details about the systematic reviews, the fourth column presents a rating of the overall quality of each review. The quality of each review has been assessed using AMSTAR (A MeaSurement Tool to Assess Reviews), which rates overall quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality. It is important to note that the AMSTAR tool was developed to assess reviews focused on clinical interventions, so not all criteria apply to systematic reviews pertaining to delivery, financial or governance arrangements within health systems. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, a review that scores 8/8 is generally of comparable quality to a review scoring 11/11; both ratings are considered “high scores.” A high score signals that readers of the review can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the review should be discarded, merely that less confidence can be placed in its findings and that the review needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1):S8).

All of the information provided in the appendix tables was taken into account by the authors in describing the findings in the rapid synthesis.

Appendix 1: Summary of findings from systematic reviews about the epidemiological effects of decriminalizing and legalizing marijuana

Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
Impact of marijuana decriminalization, medical marijuana legalization, and non-medical or recreational marijuana legalization on alcohol use (21)	<p>The review included 15 studies examining the effect of marijuana law changes (i.e., decriminalization, medical marijuana legalization, and recreational marijuana) on alcohol use in the United States.</p> <p>There were mixed findings of the effects of decriminalization of medical marijuana on alcohol outcomes. However, the decriminalization of marijuana has been shown to increase emergency room visits related to marijuana, and may be associated with an increase in prevalence of past-month and past-year marijuana use.</p> <p>The review found some evidence of substitution effects to alcohol (i.e., decreased alcohol use as marijuana becomes a substitute) in states that changed their marijuana policy towards, or including, legalization. A study examined the relationship between medical marijuana legalization, traffic fatalities, and alcohol consumption in 15 states, and found that medical marijuana legalization was associated with a decrease in per-capita sale of beer, reduced total alcohol consumption, and a decrease in alcohol-related traffic fatalities. However, it was also found that commercialization of medical marijuana in Colorado was related to increases in the proportion of drivers in fatal motor vehicle accidents who tested positive for marijuana.</p> <p>The review also found some evidence that different aspects of medical marijuana legalization may have a complement effect (i.e., liberal marijuana policies lead to increases in marijuana and alcohol use). When accounting for differences in medical marijuana legalization across states, a study demonstrated that individuals who live in states with medical marijuana legalization allowing for dispensaries had a higher chance of past-month marijuana and alcohol use in the entire sample studied. Although this study also reported that states with any medical marijuana legalization policies had fewer alcohol-related fatalities, it also found that states allowing for medical marijuana dispensaries specifically had higher alcohol-related fatalities. Additionally, another study that evaluated the effects of medical marijuana legalization on substance use found that while medical marijuana legalization was not associated with underage drinking nor the number of alcoholic drinks consumed in the past month among adults, medical marijuana legalization was positively associated with increases in frequency of binge drinking and probability of simultaneous use of alcohol and marijuana among those of legal drinking age.</p> <p>Overall, the impact of more liberal marijuana policies on alcohol is multi-dimensional, and likely depends on specific aspects of policy implementation, including laws about patient registry, dispensaries, and how long the policy has been in place.</p>	Not reported.	3/9 (AMSTAR rating from the McMaster Health Forum)	0/15
Estimate the magnitude of the relationship between substance-related implicit cognitions and the use of legal and illegal substances (117)	<p>This review examined 75 different studies, with 19,930 participants in total, that assessed participants' implicit associations with a drug and measured their use of the drug. The studies were classified based on the aspect of implicit cognition that was assessed: attitude, arousal, attention bias, semantic memory associations, and other. The studies were also categorized based on the substance that was investigated: alcohol, tobacco, marijuana, mix, and other.</p> <p>Overall, the pooling of the effect sizes associated with the relationship between substance-related implicit cognitions and the use of legal and illegal substances yielded a weighted average effect size of $r=0.31$, which</p>	Not reported in detail	2/9 (AMSTAR rating from the McMaster Health Forum)	Not reported in detail

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Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
	<p>corresponds to a medium effect size. This indicates that implicit cognition is a feasible and reliable predictor of substance use.</p> <p>Studies that involved semantic memory associations produced the largest average effect size ($r=0.38$), followed by studies investigating implicit attitudes ($r=0.27$) and attention bias ($r=0.26$). Implicit cognition significantly predicted the use of all substances examined, with the effect size for marijuana being significantly larger than other substances.</p>			
Efficacy of marijuana and other cannabinoids for treating post-traumatic stress disorder (PTSD), Alzheimer's disease, and Tourette's disorder (118)	<p>The review included 13 studies that assessed the efficacy of cannabinoids for treating PTSD, Alzheimer's and Tourette's disorder. The strength of evidence for the uses of medical marijuana for these medical conditions is very low.</p> <p>Recent single study evidence suggests poorer outcomes in PTSD patients who use marijuana; however, stronger, methodologically sound evidence is required.</p> <p>In terms of Tourette's disorder, two studies found possible improvements through self-administered scales, but not in clinician-administered scales. A Cochrane review concluded that there was insufficient evidence to support the use of cannabinoids for Tourette's disorder.</p> <p>For Alzheimer's disease there were five studies and one Cochrane review assessing the efficacy of cannabinoids on the disease. Most studies reported a "calming" effect of cannabinoids in agitated dementia patients. However, these studies were weakened by poor methodology.</p>	2015	5/9 (AMSTAR rating from the McMaster Health Forum)	Not reported in detail
Effects of legalizing cannabis for therapeutic purposes on public health and safety (12)	<p>The review included 28 studies that focused on the association between cannabis for therapeutic purposes and public health and safety. The content areas identified included: 1) cannabis for therapeutic purposes and illegal cannabis use; 2) cannabis for therapeutic purposes and other public health issues; and 3) cannabis for therapeutic purposes, crime and neighbourhood disadvantage.</p> <p>For illegal cannabis use, while inconsistencies in findings are prevalent, quite a few studies that have examined cannabis for therapeutic purposes legalization concluded that cannabis for therapeutic purposes legalization is unrelated to subsequent changes in cannabis use in the general population.</p> <p>For public health issues, researchers have examined diverse public health outcomes of cannabis for therapeutic purposes legalization. Collectively, findings suggest that cannabis for therapeutic purposes legalization may on one hand reduce alcohol use and suicide rates, while on the other hand increase unintentional ingestion by children.</p> <p>For crime and neighbourhood disadvantage, the relevant research is inconclusive; only one study finds support that dispensaries are positively related to high crime rates, and in this study it is suggested that dispensaries do not cause crime, but rather that they are disproportionately established in communities with existing high crime rates. Additionally, two studies found either no or a negative relationship between dispensaries and crime rate. While one study found dispensaries to be linked with neighbourhood disadvantage, an additional study failed to confirm this finding.</p>	2014	6/10 (AMSTAR rating from the McMaster Health Forum)	Not reported in detail

Appendix 2: Summary of findings from primary studies about the epidemiological effects of legalization or decriminalization of marijuana

Focus of study	Methods	Sample description	Key features of the intervention(s)	Key findings
<p>Investigate the association between medical marijuana laws and suicides by gender and age (28)</p>	<p><i>Methods:</i> Data from the National Vital Statistics System's Mortality Detail Files for 1990-2007 were accessed</p> <p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction studied:</i> U.S.</p>	<p>Suicide data on individuals ages 15 and older came from the Mortality Detail Files, which were produced by the National Vital Statistics System, for the 1990-1997 period</p>	<p>The study examined the effects of legalizing medical marijuana in 12 U.S. states where home cultivation permitted patients to register on the basis of select medical conditions.</p>	<p>There was a decrease in suicide rates in males in states following legalization in marijuana, whereas the suicide rates in males increased slightly in control states. There was no major difference in trend for female suicide rates in states that had legalized marijuana and control states. However, these rates were unadjusted, and regression analysis was used to account for factors such as economic conditions and relevant state policies (e.g., zero tolerance drunk-driving law).</p> <p>After adjustment for state and year effects, the relationship between legalizing medical marijuana and suicides was still negative, though not significant. Adjusting for economic conditions and relevant state policies was associated with a 6.9% decrease in overall suicide rate. This rate was reduced to 4.8% when state-specific linear time trends were included. This estimate was not statistically significant.</p> <p>When estimating the relationship between the legalization of marijuana and suicides by age and gender following adjustments, the greatest reduction of suicides occurred in men aged 20 through 39. Legalization was associated with a 10.8% and 9.4% reduction in suicide rate of men aged 20 to 29 years and 30 to 39 year, respectively. The relationship between marijuana legalization and female suicides was generally negative, particularly in older females, but these estimates were less precise than estimates for men and were sensitive to model specification.</p>
<p>Investigation on whether the prevalence of use of alternative methods of cannabis administration varied in relation to the presence of and variation in medical marijuana laws (17)</p>	<p><i>Methods:</i> Prospective observational</p> <p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction:</i> U.S.</p>	<p>2,838 self-selected sample of cannabis users who had used cannabis at least once in their lifetime</p>	<p>The survey was conducted in two phases: a 63-item version was administered over 35 days in October and November 2014, and a 72-item version over an eight-day period in February 2015.</p> <p>Respondents were classified as either living in a state where medical marijuana was legal or not. These states were then classified by duration according to when medical marijuana laws were passed, the approximate number of dispensaries and</p>	<p>Overall, the study found there was a significantly higher likelihood of vaping and using edibles among those living in medical marijuana laws states in comparison to those living in states without medical marijuana laws.</p> <p>In addition, the prevalence of ever using cannabis via vaping or edibles was significantly higher in states permitting medical marijuana than those that do not. The prevalence of any use increased based on the length of time in which medical marijuana laws had been in place, as well as according to the density of dispensaries present.</p> <p>A change in preference for the method of use was observed, moving from smoking in non-medical marijuana states to vaping and edibles in states that had legalized the use of medical marijuana. The study found no differences in the age of onset of smoking across states. However, a linear regression did find that longer</p>

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Focus of study	Methods	Sample description	Key features of the intervention(s)	Key findings
			<p>population estimates for each state.</p> <p>As of 2015, almost half of the states in the U.S. allow in-state procurement and consumption of cannabis for medical or compassionate purposes. In addition, four states also allow for recreational use and other states are considering implementing similar legislation.</p>	<p>duration of cannabis use led to later onset of vaping and edibles, whereas shorter duration of vaping and edibles led to earlier onset of use of these methods.</p> <p>Recreational legalization of marijuana was not found to significantly change these findings.</p>
<p>Estimation of changes in prescription patterns, Medicare Part D payments, and patients' out-of-pocket spending following the implementation of medical marijuana law (26)</p>	<p><i>Methods:</i> Difference-in-differences analysis</p> <p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction:</i> U.S.</p>	<p>Prescription data filled by Medicare Part D enrollees from 2010 to 2013</p>	<p>Using prescription drugs data from the Medicare Part D and linking that to basic information on the prescribing physicians, this study analyzed drugs that treat conditions for which marijuana might be an alternative treatment (i.e. anxiety, depression, glaucoma, nausea, pain, psychosis, seizures, sleep disorders, spasticity).</p> <p>This prescription drug information was mapped alongside states in which policy changes have been made to medical and recreational marijuana use.</p> <p>Twenty-four states and the District of Columbia adopted laws legalizing the use of marijuana for medical purposes despite its classification as a Schedule I drug (i.e., “no currently acceptable medical use in treatment in the United States” due to a high potential for abuse and a “lack of accepted safety for use...under medical supervision”).</p>	<p>Use of prescription drugs for which marijuana served as a clinical alternative decreased significantly after the implementation of the medical marijuana law.</p> <p>The increased availability of medical marijuana after the adoption of laws on marijuana legalization posed a significant effect on prescription drugs.</p> <p>After the implementation of the new medical marijuana law, there were fewer prescriptions written for anxiety, depression, nausea, pain, psychosis, seizures, sleep disorders and spasticity. The study found strong evidence that the observed changes in prescription patterns were associated to the passage of medical marijuana laws.</p> <p>The study suggests that spending in Medicare part D fell significantly by \$104.5 million in 2010 and that cost-savings rose \$165.2 million in 2013. These changes were accrued in the states that implemented a change in the medical marijuana law by 2013.</p>

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Focus of study	Methods	Sample description	Key features of the intervention(s)	Key findings
Examination of effect of change in cannabis policy on age of first cannabis use (19)	<p><i>Methods:</i> empirical analysis, mixed proportional hazard framework, sensitivity analysis</p> <p><i>Publication date:</i> 2017</p> <p><i>Jurisdiction:</i> Czech Republic</p>	Survey data on the extent of substance use and attitudes towards psychotropic substances of the Czech population aged 15-64 years	Personal possession of cannabis was decriminalized in January 2010 in the Czech Republic.	<p>The analysis of the two surveys found that beginning to use cannabis levelled off significantly after the age 20, with the cumulative probability starting at age 20 at 62% in 2008 and 48% in 2012.</p> <p>In terms of baseline analysis, in 2008 men were found to have a higher starting rate of cannabis use than women, but this finding was not held in the 2012 survey. Similarly, the 2012 analysis found that people with a vocational education had the lowest starting rate of cannabis use in comparison to those with only primary education.</p> <p>The decriminalization policy did not significantly affect the starting rate of cannabis use.</p>
Assessment of impact of medical marijuana legalization across the U.S. through comparison of trends of adolescent marijuana use between legalized and non-legalized states (13)	<p><i>Methods:</i> Cross-sectional survey</p> <p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction:</i> U.S.</p>	Self-reported data on six categories of priority health-risk behaviours including marijuana use from 11,703,100 high-school students, produced by the Youth Risk Behavioural Surveillance System survey administered biannually on odd years	As of 2014, 20 U.S. states and the District of Columbia had passed legislation allowing the use of marijuana for medical conditions. There was a lack of consistency between states in the medical conditions that qualify for treatment. The public health department of some states consider conditions on a case-by-case basis.	<p>In comparing states without a medical marijuana law against those with a medical marijuana law, specifically comparing Utah to Nevada and Idaho to Montana, the state with the policy of legalized use of medical marijuana showed a decreased probability of marijuana use after its implementation. Further, the analysis found no change reported past 30-day marijuana use.</p> <p>Additional sub-analysis by grade was conducted which demonstrated decreased marginal probabilities for marijuana use in Grades 10 and 12 in the Utah/Nevada model and in Grade 9 in the New York/Vermont model.</p> <p>No states were found to demonstrate changes in reported marijuana use attributed to the implementation of the new marijuana laws.</p> <p>Overall, the study did not find an increase in marijuana use in adolescents related to legalization of medical marijuana.</p>
Examination of the prevalence and correlation of support for legalization of marijuana and intention to use marijuana on a more frequent basis should legalization laws be implemented (6)	<p><i>Methods:</i> Cohort study</p> <p><i>Publication date:</i> 2017</p> <p><i>Jurisdiction:</i> U.S.</p>	Data from national sample of men and women from ages 18 and 34 obtained from Wave 7 of the Truth Initiative Young Adult Cohort	As of 2015, over half of U.S. states have legalized, decriminalized or legalized medical use of cannabis consumption in various forms	Males, white respondents, or those with less than a high school education had higher intentions to use marijuana more frequently if legalization laws were passed. There were statistically significantly more marijuana users who indicated they would use marijuana more frequently after legalization when compared to non-users. Indicators of greater intention to use marijuana on a more frequent basis after legalization included past 30-day alcohol, tobacco, and other drug consumption. There was a statistically significant correlation between intentions to use marijuana and social smoking status. In addition, perceptions of marijuana as less than or equally

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Focus of study	Methods	Sample description	Key features of the intervention(s)	Key findings
				harmful as cigarettes were also significantly correlated with intention to use marijuana after legalization.
Assessment of the impact of Australia's marijuana decriminalization policy on marijuana-smoking prevalence (9)	<i>Methods:</i> Cross-sectional survey <i>Publication date:</i> 2010 <i>Jurisdiction:</i> Australia	Data of the non-institutionalized civilian Australian population of age 14 and above were obtained from the 2001 Australian National Drug Strategy Household Surveys (NDSHS 2001), the Australia Bureau of Statistics, and the Australian Illicit Drug Report	As of 2001, possession and cultivation of small quantities of marijuana for personal consumption had been decriminalized in South Australia, Australia Capital Territory, and Northern Territory.	The general results across all models demonstrated that decriminalization has a positive and significant impact on marijuana smoking behaviour. Some models demonstrated that having a tertiary education reduces the likelihood of smoking marijuana substantially for those living in a decriminalized state. Alternatively, in non-decriminalized states, marijuana smoking prevalence had no correlation with tertiary education. The unrestricted endogenous probit switching model suggested that the decriminalization policy would lead to higher participation in marijuana smoking.
Onset of cannabis-use disorder symptoms among recent users (119)	<i>Methods:</i> cross-sectional survey <i>Publication date:</i> 2017 <i>Jurisdiction:</i> U.S.	Annual National Survey on Drug Use and Health participants (from 2002 to 2014), ages from 12 to 21 years, who reported using marijuana at least once in the past month and having had their first exposure to marijuana within the past two years	Intervention was response to an annual survey that examined the frequency of marijuana use and an assessment of use disorder symptoms. Frequency of use was measured by asking participants how many days they used marijuana in the past 30 days, and the number of day in the past year. The assessment of marijuana use disorder symptoms was based on eight of a possible 11 symptoms listed in the Diagnostic and Statistical Manual of Mental Disorders (fifth edition).	A number of major findings emerged from the survey., the first being that more frequent marijuana use was associated with higher rates of each use disorder symptoms. The second finding was that despite relatively infrequent use (i.e., less than five days in the past month) users reported experiencing marijuana disorder symptoms. More than half of the adolescents using marijuana reported experiencing tolerance, and more than three-quarters reported spending large amounts of time to obtain, use, or recover from marijuana use. In examining differences in socio-demographics, younger adolescents were significantly more like than older adolescents to report the majority of marijuana use symptoms, confirming previous research on the increased vulnerability of these individuals.
Description of lessons learned in the first three years following legal sales of marijuana in Colorado (4)	<i>Methods:</i> Mixed methods (i.e., population-based surveys, hospital patient data, poison center call data, State Patrol Data) <i>Publication date:</i> 2017 <i>Jurisdiction studied:</i> Colorado, U.S.	Population of Colorado	In November 2012, voters approved legalized recreational marijuana in Colorado. Sales of recreational marijuana began on January 1, 2014, when Colorado became the first state to allow legal sales.	The study found that there was no change in past 30-day marijuana use among adults between 2014 and 2015, and no significant change in past 30-day marijuana or lifetime marijuana use among high school students between 2013 and 2015. However, youth perception of risk of regular marijuana use decreased significantly. There was an increase in hospitalization with marijuana-related codes by 70% between 2013 and 2015. Emergency Department (ED) visits increased 19% between 2013 and 2014, with a disproportionate increase among tourists. However, ED visits decreased 27% between 2014 and 2015. After the first year of

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				<p>legalization, calls to poison centres for children ages 0 to 8 years increased by 63%, and stabilized in the following years.</p> <p>There was also an 80% increase in fatalities where the driver tested positive for cannabinoids from 2013 to 2015, though this data does not indicate whether the driver was impaired or at fault.</p> <p>The authors recommend strengthening safety policies (e.g., child-proof packaging), investing marijuana tax revenue in social market research to maximize health messaging impacts, and ensuring regulations between medical and non-medical marijuana are aligned.</p>
<p>Report findings from a cross-cultural study of small-scale cannabis cultivation for medical purposes, and compare the appearance of medical motives in the sample of cannabis growers from six different countries (120)</p>	<p><i>Methods:</i> Data was gathered from the International Cannabis Cultivation Questionnaire that measured patterns of small-scale cannabis cultivation</p> <p><i>Publication date:</i> 2015</p> <p><i>Jurisdiction studied:</i> Australia, Belgium, Denmark, Finland, Germany, and the U.K.</p>	<p>5,313 cannabis growers across the six countries who had grown cannabis during the past five years and had completed at least 50% of the questionnaire</p>	<p>At the time when this article was written, formal laws and policies in all six countries were very similar. Access to cannabis treatment is generally strictly regulated and predominantly limited to certain specific medical conditions. Additionally, with the exception of industrial hemp and licensed growing for scientific purposes, cannabis growing is illegal in all six countries. However, in Belgium, an adult will not receive a criminal record if they are not growing more than one plant. Another exception is in Germany, where seriously ill patients may grow their own cannabis for medicinal uses.</p>	<p>The study found that a sizeable proportion of the recruited cannabis growers grew for medical reasons (45%). The prevalence of reporting medical needs as a reason for growing was highest in Australia, Finland, and the U.K., and lowest in Belgium. Other common reasons for growing were for personal use, the pleasure gained from growing cannabis, to avoid contact with criminals, belief that their personally-grown cannabis is healthier than cannabis that is bought, and self-growing being cheaper than buying. Only 9% of all medical growers expressed a selling motivation as a reason of growing.</p> <p>Medical growers reported using cannabis for a wide variety of serious conditions. The most frequently reported conditions fell into two basic categories of physical illnesses and mental health problems. Physical illnesses included chronic pain, inflammation of the joints, and migraine/headaches. Mental health problems included depression, anxiety and panic disorders. Insomnia and sleeping problems were also mentioned often.</p> <p>In the samples of medical growers across six countries, three out of four reported having an authorized medical record for their conditions, and thus a valid basis for their medical use of cannabis. However, only a minority of growers with a formal diagnosis had discussed the use of cannabis as medication with their physicians. Approximately 60% of medical growers with a diagnosis reported that they were not recommended cannabis by their doctor, and that they had not asked for it. Additionally, approximately one in five respondents reported that their doctor recommended the use of cannabis, which is surprisingly high in the context of limited legal access to medical cannabis.</p>
<p>Compare demographic and clinical characteristics between</p>	<p><i>Method:</i> Data was extracted from the 2013 National Survey on Drug Use and</p>	<p>7,835 individuals aged 18 or older who had used cannabis in the past year</p>	<p>Individuals included in the analysis were from the 24 states and the District of Columbia</p>	<p>Amongst the individuals who lived in the states with medical cannabis legislation, 83% used it for recreational purposes and 17% used it for medical purposes. People who used medical cannabis</p>

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Focus of study	Methods	Sample description	Key features of the intervention(s)	Key findings
recreational cannabis users and medical cannabis users (24)	Health, a national cross-sectional survey across the U.S. <i>Publication date:</i> 2016 <i>Jurisdiction studied:</i> U.S.	were included for analysis, with 3,200 living in a state that had legally approved the use of medical cannabis at the time of the interview	where cannabis has been legalized for medical use. Most of these states require that a physician submits a signed form to the state and the state provides a card as verification that the patient qualifies for legal medical cannabis use.	were more likely to use it on a daily basis and less likely to meet criteria for an alcohol use disorder or to use other illicit drugs. There was a greater proportion of recreational users who were in the younger age categories (18-25 and 26-34), and recreational users were more likely to be employed full-time or part-time compared to medical users. A greater percentage of individuals with medical cannabis use reported psychological distress, and those with medical cannabis use also had greater disability when performing activities. There was no significant difference in race/ethnicity, education level, and prevalence of major depressive episode between the two groups.
Examine trends in marijuana use and attitudes towards marijuana among youth before and after decriminalization (5)	<i>Method:</i> Data was extracted from the annual, national (U.S.) Monitoring the Future study to survey marijuana use in the 8 th , 10 th , and 12 th grade. The survey uses a three-part, stratified research design, first sampling geographic areas, then specific schools, and then students within schools. Comparisons were made between high-school students in California and outside of California before and after legislation was passed in 2010 to decriminalize marijuana. <i>Publication date:</i> 2015 <i>Jurisdiction studied:</i> U.S.	A total of 97,238 high-school students were surveyed, some of which were residents of California	In 2010, legislation was introduced in California so that marijuana possession was decriminalized. As a result, possession of small amounts of marijuana would not warrant a misdemeanor/higher-level crime and would not be noted on an individual's criminal record. The penalty is now an infraction, resulting in only a fee.	Amongst the 12 th graders, the study results support the “signalling hypothesis,” the idea that marijuana decriminalization signals to youth that using marijuana is not dangerous, leading to increases in youth acceptance and use of marijuana. Following decriminalization in California, youth marijuana use increased at a significantly greater rate than other U.S. states. Similarly, the proportion of 12 th graders who had used marijuana in the past 30 days became significantly higher among California compared to non-California youth following decriminalization. Additionally, youth attitudes toward marijuana use became significantly more permissive among California 12 th graders compared to their peers in other jurisdictions where marijuana was not legalized. Californian 12 th graders also reported less perceived harm and personal disapproval of regular marijuana use, and a higher expectancy that they would use marijuana within five years. However, when considering the results of the 10 th graders, an alternative version of the signalling hypothesis is supported that suggests the effects of decriminalization are limited to a single birth cohort (the 12 th grade cohort), since the predicted effects of the signalling hypothesis were not as pronounced amongst the 10 th grade cohort. The results of the study also indicated that the signalling effect does not extend to 8 th graders.
Investigate patterns of cannabis use, degree of overlap between medical and recreational users, as well as differences in their use patterns, methods of	<i>Methods:</i> A three-minute survey (RAND Marijuana Use West Coast States survey) that consisted of a series of questions on medical and recreational cannabis use patterns, as well as questions regarding where	2,009 individuals from Washington (n=787), Oregon (n=506), Colorado (n=503), and New Mexico (n=213), aged 18 to 91 years, with a mean age of 53 years	All four states investigated in the study have established medical cannabis laws. Qualifying medical conditions that are covered by all four states include cancer, glaucoma, HIV/AIDS, seizure disorders, cachexia, muscle	The study found rates of life-time medical cannabis use were similar in Colorado and Washington: 8.8% and 8.2%, respectively. In contrast, in the control states that did not legalize recreational marijuana, only 6.5% of respondents in Oregon and 1% of respondents in New Mexico ever used medical cannabis. Most individuals who ever used medical cannabis also reported recreational use (86%).

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consumption, and source for cannabis (25)	<p>and how cannabis is used and at what price it is obtained</p> <p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction studied:</i> Colorado/Washington/Oregon/New Mexico, U.S.</p>		<p>spasms, severe pain, and severe nausea.</p> <p>During the survey period in the study the states did not allow retail stores for recreational use. Thus, only medicinal users had a legitimate source of supply beyond home cultivation, allowing the survey to describe patterns of use and access to cannabis among medicinal and recreational users before retail stores for recreational cannabis were open.</p>	<p>Recreational use was higher than medical use in all four states: 45% of respondents in Washington and Oregon, 36% in Colorado, and 32% in New Mexico reported ever using cannabis recreationally.</p> <p>Individuals who used cannabis for recreational purposes were more likely to report using it with alcohol. Approximately 17.4% recreational users report simultaneous use of alcohol and cannabis most or all the time, and fewer than 3% of medicinal users report frequent simultaneous use cannabis and alcohol. Individuals who used cannabis for both purposes did not commonly use it regularly with alcohol.</p>
Investigate the effect of the distance to the nearest cannabis shop on the age of onset of cannabis use (20)	<p><i>Methods:</i> Data that was collected in a survey in 2008 that focused on questions about alcohol and drugs was analyzed in terms of two birth cohorts (young and old cohort) and used to determine cannabis use and onset of cannabis use</p> <p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction studied:</i> Netherlands</p>	8,000 individuals from 5000 households in the Netherlands	<p>The Netherlands abides by a tolerance policy, which aims to provide quasi-legal access to cannabis. The intention of the policy is to provide an organized environment for selling cannabis and keeping customers away from otherwise illegal ways of purchase where they can come across dealers of more harmful drugs. Fundamental rules of the policy include: no sale of hard drugs, no advertising, no sale to youth below 18 years of age, no nuisance, and no more than 500 grams of cannabis on site. When the policy of tolerance was publicly announced in 1980, there was a sharp increase in the number of cannabis shops, with approximately 1,500 shops by the mid-1990s. Through changes in how the shops could operate and laws granting local governments more flexibility to close cannabis shops in their municipalities, the number of cannabis shops decreased to 651 by 2011.</p>	<p>The study distinguished two birth cohorts to determine whether their behaviour was potentially influenced by the presence of cannabis shops, since many individuals from the old cohort grew up when cannabis shops didn't exist. The young cohort was born between 1974 and 1992 (988 observations), and the old cohort was born between 1955 and 1973 (1,615 observations).</p> <p>The study found that for the young cohort of individuals, distance to a cannabis shop had a negative effect on the starting rate of cannabis use.</p> <p>To determine whether this is a causal effect, two types of counterfactual analysis were conducted. In the first counterfactual analysis, the study investigated whether distance to a cannabis shop had a negative effect in the old birth cohort. The old cohort couldn't have been affected by the presence of cannabis shops because when they began using cannabis while growing up, the cannabis shops did not exist. The study found no significant effect of the distance to a cannabis shop on the uptake of cannabis for the old cohort. In the second counterfactual analysis, the relationship was determined between tobacco uptake and distance to a cannabis shop. Again, no significant distance effect was found, suggesting that cannabis shops are not located in areas where individuals are more likely to start smoking and using cannabis. The two counterfactual analyses suggest a causal effect of shorter distance to a cannabis shop on earlier onset of cannabis use.</p> <p>Overall, the study concludes that youth who live more than 20 km from a municipality with a cannabis shop have a lower starting rate</p>

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<p>Examine prevalence of marijuana use and consequences, and compare characteristics between marijuana users and non-users (121)</p>	<p><i>Methods:</i> A survey was sent to college students from the psychology department at 11 universities throughout the United States</p> <p><i>Publication date:</i> 2017</p> <p><i>Jurisdiction studied:</i> U.S.</p>	<p>8,141 college students were recruited from the psychology departments of 11 universities of different States</p>	<p>In the states where recreational marijuana use is legal, citizens aged 21 or older have a constitutional right to possess and consume marijuana for recreational purposes. Citizens do not need to be residents of the state.</p> <p>In the states where medicinal marijuana use is legal, citizens must contact registered practitioners to receive certification to use medicinal marijuana. The eligibility of the citizen for a certificate is at the discretion of the practitioners. A registry ID must be used (which requires the certification) in order to purchase medicinal marijuana from a dispensing facility.</p> <p>In states without provisions for legal marijuana use, the above conditions and laws do not exist.</p>	<p>of cannabis use, whereas those who live closer to a cannabis shop are more likely to start using cannabis earlier on.</p> <p>This study presents a number of descriptive statistics on marijuana-related variables for adolescents in universities in the U.S, focusing on the prevalence of marijuana use, the consequences of its use, as well as comparing users of cannabis versus non-users.</p> <p>The study found that nearly half of all sampled students had used marijuana once in their life, with one-quarter having used it in the past month. On average, users of marijuana experienced eight negative consequences from marijuana use in the past month. Examples of these negative consequences including driving a car under the influence of cannabis, feeling sluggish the morning after cannabis use, or doing embarrassing things.</p> <p>Compared to lifetime non-users of marijuana, lifetime users perceived others to be more approving of marijuana, reported more positive beliefs about marijuana users, identified more with marijuana users, were more supportive of marijuana legalization and decriminalization, and were more likely to not view marijuana as addictive.</p>
<p>Explore cannabis user perceptions and practices between Amsterdam and San Francisco (35)</p>	<p><i>Methods:</i> Surveys were sent out to representative samples of experienced cannabis users containing questions regarding the four policy issues</p> <p><i>Publication date:</i> 2009</p> <p><i>Jurisdiction studied:</i> San Francisco, U.S., and Amsterdam, the Netherlands</p>	<p>Data from 4,364 individuals from Amsterdam and data from 891 individuals from San Francisco were included</p>	<p>Amsterdam is characterized as a city with <i>de facto</i> decriminalization of marijuana, meaning that decriminalization of marijuana is the norm, but not necessarily enforced by law. Specifically, possession remains a crime, but the Ministry of Justice does not enforce the law.</p> <p>San Francisco is characterized as a city with <i>de jure</i> criminalization.</p>	<p>Compared to cannabis users in Amsterdam, San Francisco cannabis users were much more likely to obtain their cannabis through friends. In Amsterdam, the majority of respondents reported obtaining their cannabis through licensed coffee shops. None of the Amsterdam respondents obtained cannabis through street dealers, and none of the San Francisco respondents obtained their cannabis through coffee shops.</p> <p>Only one in six Amsterdam respondents reported that they were able to obtain drugs other than cannabis at their source for cannabis. Meanwhile, nearly half of San Francisco respondents reported that they were able to obtain drugs other than cannabis at their source for cannabis.</p> <p>San Francisco respondents were more likely to report that cannabis had been too expensive for them to purchase. However, in both</p>

Focus of study	Methods	Sample description	Key features of the intervention(s)	Key findings
				<p>jurisdictions, the majority of respondents agreed that they had never found cannabis to be too expensive.</p> <p>Compared to respondents in San Francisco, Amsterdam respondents had a preference for cannabis of a milder potency.</p> <p>Additionally, the perceived risk and fear of arrest was greater in San Francisco than in Amsterdam, though in both jurisdictions the majority perceived arrest as unlikely.</p>
<p>Examine whether attitudes towards the acceptability and stigma of medical marijuana are affected by its method of administration and severity of illness it is meant to treat (122)</p>	<p><i>Methods:</i> Several surveys were sent to participants to obtain quantitative data</p> <p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction studied:</i> U.S.</p>	<p>The study had a total of 611 participants (200 males, 209 females, two omitted gender) with a mean age of 25.61</p> <p>n</p>	<p>Participants were assigned one of three illnesses with varying severities that was to be treated with marijuana (sinus infection or cancer or AIDS), and one of two referral methods (close friend or patient’s doctor), resulting in a total of six experimental conditions.</p> <p>The questions from the surveys examined the participants’ attitudes towards the acceptability and stigma of medical marijuana, their concern for legal consequences of taking marijuana through each of the 10 administration methods, and their willingness to use medical marijuana by the different administration methods.</p>	<p>The study found that marijuana that was administered through a method that resembled traditional medicine (e.g., pills, sublingually, oral suspension) was rated the most acceptable, and had the least stigma. On the contrary, marijuana administered in a way that resembled recreational use (e.g., cigarettes or water pipes) was rated less acceptable and had more stigma. As expected, administration methods that resembled both medicinal and recreational use received intermediate ratings on acceptability and stigma.</p> <p>Legal concerns and stigma were lower and acceptability was higher when medical marijuana was used to treat a more serious illness (AIDS and cancer). Furthermore, legal concern was slightly higher when marijuana use was recommended by a friend as opposed to a physician.</p> <p>Acceptability and stigma ratings were found to be the strongest predictors for future willingness to consider using medical marijuana, whereas legal concerns and knowing a medical marijuana user did not significantly predict consideration of using medical marijuana. Additionally, participants who knew a medical marijuana user rated medical marijuana as more acceptable, having less stigma, and were more likely to consider its use than participants who did not know somebody who had used medical marijuana.</p>
<p>Examine the trends in fatal motor vehicle crashes before and after commercialization in Colorado, and compare these trends with 34 non-medical marijuana states (33)</p>	<p><i>Methods:</i> Data were obtained from the 1994-2011 Fatality Analysis Reporting System (FARS) to examine trends in the proportions of drivers in fatal motor vehicle crashes who were alcohol impaired and marijuana-positive</p> <p><i>Publication date:</i> 2014</p>	<p>The sample included all qualifying motor-related fatalities from the 1994-2011 FARS</p>	<p>Although Colorado voters approved the legalization of medical marijuana in 2000, very few medical marijuana applications were submitted until 2009. In 2009, there was a change in federal policy, ending raids on distributors of medical marijuana in legalized states. Additionally, the Colorado Board of Health rejected a limit on the number of patients a caregiver could aid,</p>	<p>The study used mid-2009 as the beginning of the large-scale marijuana commercialization in Colorado.</p> <p>In Colorado, there was a significant positive trend in the proportion of drivers in fatal motor vehicle crashes who were marijuana-positive during the post-commercialization period. In the 34 non-medical marijuana states (NMMS), there was not a significant trend in the proportion of drivers in a fatal motor vehicle crash who were marijuana-positive during the pre-commercialization marijuana period, nor a significant change in trend during the post-commercialization period. After mid-2009, Colorado had a</p>

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	<i>Jurisdiction studied:</i> Colorado, U.S., and 34 other non-medical marijuana states		which lessened restrictions on who could cultivate and distribute medical marijuana. As a result, this decision facilitated the establishment of large-scale retail medical marijuana dispensaries.	significantly greater positive change in trend compared with NMMS. In both Colorado and NMMS, no significant changes were seen in the proportion of drivers in fatal motor vehicle crashes who were alcohol impaired. Additionally, there was no significant differences comparing Colorado and NMMS in trend during the pre-commercialization and post-commercialization period on the proportion of drivers in a fatal motor vehicle crash who were alcohol impaired.
Investigate potential effects of medical marijuana laws on potency (16)	<i>Methods:</i> Difference-in differences analysis <i>Publication date:</i> 2014 <i>Jurisdiction studied:</i> 51 U.S. jurisdictions	39,157 marijuana samples seized by law enforcement in 51 U.S. jurisdictions from 1990-2010 were analyzed	As of mid-2013, 20 states have adopted laws giving patients the rights to possess and use marijuana for medical purposes without the threat of state prosecution and punishment. At the time the study was published, 13 states have implemented, or are in the process of establishing, state-licensed medical marijuana dispensary systems. Fifteen medical marijuana states also offer personal home cultivation as another supply option. In 2012, Colorado and Washington passed ballot initiatives providing for legalized recreational marijuana use. No state law directly regulates the THC content of medical marijuana. As of mid-2013, 16 states have decriminalized marijuana by removing penalties for possessing small amounts of marijuana intended for personal use.	The study's fully elaborated model provided evidence that potency (THC content) increased by a half percentage point on average following legalization of medical marijuana, although this result was not significant. The study also investigated the impact of specific medical marijuana supply provisions on potency. Legally operating dispensaries were found to be associated with significant increases in THC levels of approximately one percentage point on average in states that permit retail sales.
Analyze economic costs and benefits associated with cannabis legalisation (36)	<i>Methods:</i> Cost benefit analysis to value the costs and benefits of two cannabis policy options <i>Publication date:</i> 2014	General population of New South Wales, Australia	One of the policies assessed in this study is the status quo, where cannabis is illegal, in New South Wales (NSW), Australia. In NSW there are diversion programs such as cannabis cautioning for the possession of a small amount of cannabis for adults, and warnings	The results of the cost benefit analysis for the two policies were expressed as a net social benefit. All costs and benefits were expressed in 2007 Australian dollars (AUD). The total cost pertaining to the current New South Wales (NSW) policy was estimated to be \$80.1 million per annum (p.a.) and \$90.7 million p.a. for the legalized-regulated policy. For the status quo, the largest single expenditure was on criminal penalties, followed by

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	<i>Jurisdiction studied:</i> New South Wales, Australia		<p>for juveniles, neither of which result in a criminal record.</p> <p>The other is a modelled, highly legalized-regulated policy. The key characteristics of this policy includes licensing consumers, cannabis only retail shops, disallowing promotion and advertising, monopoly distribution and retail, age restrictions, restrictions on location of consumption, and pre-negotiated purchase contracts with growers.</p>	<p>policing costs. For the alternative legalized-regulated policy, the largest expenditure was personal costs of licensing, followed by consumer information, and prevention and education services.</p> <p>The mean net social benefit for the status quo was \$294.6 million p.a. and \$234.2 million p.a. for the legalized-regulated model (excluding potential revenue to government). When the government revenue is included, the net social benefit for legalized-regulated is higher than status quo. However, this also results in a greater uncertainty of the results, since this assumes that all revenues which go to the government are new revenues (i.e., in the status quo, no portion of the revenue from the illicit cannabis market returns to the government as revenue).</p> <p>In conclusion, there seems to be no major difference between the net social benefit for these policy options, suggesting that the policy alternatives are similar in their efficient use of society's resources.</p>
Investigate the associations between types of cannabis control policies at a country level and prevalence of adolescent cannabis use (123)	<p><i>Methods:</i> Cross-sectional international survey</p> <p><i>Publication date:</i> 2015</p> <p><i>Jurisdiction studied:</i> 38 countries</p>	172,894 adolescents 15 years of age (83,294 boys and 89,600 girls) who participated in the 2001/2002, 2005/2006, or 2009/2010 cross-sectional Health Behaviour in School-Aged Children (HBSC) survey were included	The countries investigated in this study were categorized into four models of cannabis control at the country level: 1) full prohibition, or the traditional criminal prohibition regime; 2) decriminalized, or prohibition with cautioning or diversion; 3) decriminalization, or prohibition with civil penalties; and 4) partial prohibition, including 'De facto' and 'De jure' legalization.	<p>Overall, the study found that adolescents who lived in countries that had liberalized cannabis use were more likely to ever use cannabis, use in the past year, and use regularly. Boys were found to have a significantly higher prevalence of cannabis use, though the correlation between cannabis use and cannabis liberalization was weaker in boys compared to girls.</p> <p>The differences in cannabis use patterns in terms of the four detailed types of cannabis control policies were also reported. The odds of past-year cannabis use among adolescents living in countries with decriminalized policies was 1.14 times higher compared to their counterparts in other countries. Additionally, decriminalized and partial prohibition predicted higher levels of regular cannabis use.</p> <p>Cannabis liberalization was significantly correlated with higher odds of using cannabis regularly after the policy had been implemented for five to 10 years and more than 10 years, whereas the correlation was not significant within five years of policy introduction. The duration of policy implementation had no impact on ever used or past-year use of cannabis.</p>
Examine relationships between cannabis use and neurocognitive functioning in a non-clinical adult sample (124)	<i>Methods:</i> Participants completed a Structured Clinical Interview for DSM-IV Disorders (SCID), the Brief Drug Use History	The sample included 158 participants that were recruited at local college campuses and the community	Participants were grouped based on their reported personal cannabis use: recent users (n=68), past users (i.e., more than 28 days (n=41), and non-users (n=49).	The study found significant differences in global neurocognitive performance among the three cannabis use groups. There were significant group differences in attention/work memory performance, such that recent users demonstrated a poorer performance than past users and non-users. Additionally, there were significant group differences in speed of information

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	<p>Form, and neurocognitive assessment</p> <p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction studied:</i> U.S.</p>			<p>processing and executive functioning, such that non-users performed better in both these domains than recent and past users.</p> <p>The study also examined whether frequency of cannabis use in the last four weeks and number of times used per day will be negatively associated with neurocognitive performance among recent users. The amount of times cannabis was used in the last four weeks was negatively associated with global neurocognitive performance, and cognitive domains of attention/working memory, learning/memory, information processing speed, and executive functioning. Likewise, the amount of times cannabis was used per day was negatively associated with global neurocognitive performance, and cognitive domains of attention/working memory, learning/memory, information processing speed, and executive functioning.</p> <p>Among recent and past cannabis users, the study did not find any significant correlation between time since last use and global cognitive function or individual cognitive domains.</p>
<p>Examine whether adult cigarette smokers who resided in states with long-term legalization of medical marijuana had a higher prevalence and frequency of marijuana use, greater nicotine dependence, or social acceptability of marijuana (125)</p>	<p><i>Methods:</i> Data were obtained from the 2014 Tobacco Attitudes and Beliefs Survey, a web-based survey that assessed participants' marijuana use, beliefs and attitudes on marijuana, and nicotine dependence</p> <p><i>Publication date:</i> 2017</p> <p><i>Jurisdiction studied:</i> U.S.</p>	<p>The sample included 506 adults 45 years and older who “regularly smoke cigarettes”</p>	<p>At the time the study was conducted, 11 states have legalized medical marijuana for 10 or more years (e.g., California, Oregon, Washington and Colorado). As of 2015, the possession and sale of recreational marijuana was legal in Colorado, Washington, Oregon, and the District of Columbia.</p>	<p>The study examined the effect of the legalization of marijuana on three factors: marijuana use, nicotine dependence, and attitudes towards marijuana.</p> <p>In the sample studied, 73% of adult cigarette smokers responded “yes” to ever using marijuana in their lifetime. States that had medical marijuana use legalized for a greater period of time was significantly associated with increases in marijuana use prevalence in a lifetime: 85% in states with 10 or more years, 73% in states with less than 10 years, and 68% in states where medical marijuana was illegal. Similarly, marijuana use frequency in the past 30 days was positively associated with years of state-wide legalization of medical marijuana: 17.3 days in states that legalized 10 or more years ago, 14.3 in states that legalized less than 10 years ago, and 10.5 days in states where medical marijuana was illegal.</p> <p>Nicotine dependence was assessed using both the Fagerstrom Test for Nicotine Dependence (FTND) and the Hooked on Nicotine Checklist (HONC). Cigarette smokers who indicated marijuana use in the past 30 days had higher FTND and HONC scores compared to those who indicated no marijuana use. This difference was stable across the three legalization categories.</p>
<p>Impact of decriminalization of cannabis on its use (10)</p>	<p><i>Methods:</i> Cross-sectional survey</p>	<p>39, 087 individuals living in Australia between the ages</p>	<p>Decriminalization of marijuana in all four states in Australia that have decriminalized as compared</p>	<p>The survey found that about 57% of individuals in the sample had used cannabis in their lifetime. The average age of initiation was found to be 17.5 years.</p>

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	<p><i>Publication date:</i> 2014</p> <p><i>Jurisdiction studied:</i> Australia</p>	<p>of 20-40 at the time of the survey covering 12 years</p>	<p>to states where marijuana remains prohibited.</p>	<p>The hazard rate of starting to use cannabis peaks at 16 and 18, and uptake of cannabis use is rare after the age of 25. A higher rate of individuals in states where marijuana had been decriminalized had used marijuana compared to control jurisdictions.</p> <p>Results from the survey suggest that decriminalization has a significant positive effect on the uptake of cannabis use. Living in a regime where cannabis has been decriminalized is estimated to result in a 12% increase in cannabis use as compared to jurisdictions where it has not been decriminalized. Similarly, people living in states which decriminalized marijuana during the observation period (1970-2012) had higher transition rates into cannabis, ranging from 25 to 50% higher, compared to those living in control jurisdictions. Minors who live in a jurisdiction that has decriminalized marijuana have an uptake rate 12% higher than otherwise similar individuals living in a policy regime where cannabis is a criminal offence.</p> <p>Overall, the results of this study suggest that decriminalization leads to uptake at an earlier age than would otherwise occur under a prohibition regime, however decriminalization does not affect whether an individual ever uses marijuana. A shift is also seen whereby the timing of uptake moves from adulthood to juvenile years.</p> <p>A critical finding however is that after five years of the policy being implemented no difference is observed in uptake.</p>



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