



WHITEPAPER

Cannabis Industry Overview

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Introduction

Cannabis, also known as “marijuana” colloquially, is an annual flowering plant from the family Cannabaceae, which is native to Central Asia and the Indian sub-continent. The plant has psychoactive (affecting the mind) properties and is used for industrial, recreational, and medical purposes.

The three most common species are *Cannabis sativa*, *Cannabis indica*, and *Cannabis ruderalis*.

Cannabis sativa grows in hotter climates with longer daylight and lots of sunshine; as such, it was originally seen in countries near the equator, such as Colombia, Mexico, and Thailand. The plants generally grow 8-12 feet and have long, thin finger-like leaves, which help them capture as much sunlight as possible. They take a long time to grow but produce high yields, making cultivation rewarding, and they flower in autumn, when nights are longer, and die soon after flowering. The buds of *sativa* are loose, less dense, and light; have a wispy-hair appearance; and are red or orange in color. *Sativa* has been described as having an energizing or uplifting effect when consumed, due to its primary psychoactive compound, tetrahydrocannabinol (THC).

Cannabis indica originally hails from the environmentally hostile Hindu Kush mountains in Central Asia, and nowadays, it is generally found in countries 30 degrees north of the equator, such as in Afghanistan, Turkey, and Morocco. To protect itself from the harsh environment, *Cannabis indica* produces resin, a sticky organic substance very dense in cannabinoids, that makes *indica* psychoactively very powerful when consumed. The plants generally grow four feet tall, much shorter than *Cannabis sativa* does, with broad, wide, round and dark green leaves and seeds with a marble-like pattern. They are very responsive to changes in light, and similar to *sativa*, they flower only in autumn and die soon after flowering. The buds of *indica* are more compact and shorter than those of *sativa*. The buds look fuller and firmer when one touches them and are purple in color. Unlike *sativa*, *indica* has been said to have a muscle relaxing and sedating effect.^{1,2,3}

Finally, *Cannabis ruderalis* that originated in Russia is not as common as *Cannabis indica* or *Cannabis sativa*. The plants generally grow two feet high and have shorter leaf fingers, similar to those of *indica*, making it ideal for growing outdoors. It has a wild and an unbranched appearance, making it highly resistant to pests and diseases. One big difference between *ruderalis* and other species is that *ruderalis* plants are autoflowering; they automatically go into the flowering state as time passes (generally in 21-30 days) and continue to flower throughout the year till they die, while the other species require a change in the amount of sunlight they get in the day to enter the flowering phase. *Ruderalis* is ready to harvest in 10 weeks after seeding. *Ruderalis* is less psychoactive in nature and thus it is not used for recreational purposes. Instead, *Cannabis ruderalis* wild strains are used to create hybrid species. Hybrids are crossbred varieties of cannabis having the genes of both *indica* and *sativa*. These hybrids are referred to as *indica* dominant, *sativa* dominant, or balanced, depending on the characteristics.⁴

The cannabis plant remains in the vegetative stage when it receives at least 12 hours of sunlight. During this phase, male and female plants are very similar and it is difficult to distinguish between them, although the female plant tends to be stockier and flower later than the male plant. The plant enters the flowering stage as the days grow shorter and night grows longer (in autumn). At this stage, the density of leaves on the upper part of the plant begins to differ, with the male plant having fewer leaves than the female plant. The male plant flowers in long, loose clusters, 6-12 inches long, whereas the female plant flowers in tight, crowded clusters. The primary source of cannabinoids in cannabis are the unfertilized flower heads, flower bracts, and upper leaves of the female plant.

When grown in the wild, the cannabis plant has limited growth owing to a lack of nutrients. It produces only small quantities of seeds, fiber, and oil as compared with cultivated species. To maximize production quality for recreational and medical use, cannabis is produced hydroponically in a greenhouse or an enclosed room, where environmental conditions (such as water, temperature, and light) can be controlled.^{5,6}

Major Psychoactive Components

Scientists have identified 483 types of unique chemical compounds in cannabis, more than 100 of which are called cannabinoids, which have a profound effect when they interact with receptors in the human body. The most important one is tetrahydrocannabinol (THC). THC is created when the plant matter is dried and heated by smoking or cooking. When THC binds to some receptors found in the brain and the immune system, it changes how the brain functions, with effects including relaxation, reduced pain, and increased appetite.

Other important compounds found in cannabis are cannabidiol (CBD) and cannabinol (CBN). CBD is non-psychoactive, and, unlike THC, it does not bind with receptors in the body. However, it can stimulate activity without actually binding with the receptors. In addition, CBD can boost the release of certain unique chemicals naturally produced in the body, which can stimulate the receptors and enhance the overall effect in the body. CBD is found to have anti-anxiety, anti-psychotic, anti-convulsive, and sedative properties, and there has been an increasing interest in its effects.⁷ CBN, on the other hand, has mild psychoactive properties and increases the effects of THC. CBN is created when THC is exposed to oxygen and light, and it is found to have anti-depressive and sedative properties. Cannabis sativa has a higher THC percentage, whereas Cannabis indica has a higher CBD content.⁸

Medicinal Uses

Uses of Cannabis in History

Current Uses of Cannabis

The medical use of cannabis has not been rigorously tested globally due to production restrictions and governmental regulations. The United States of America's (US) Food and Drug Administration (FDA) has not approved cannabis as a medical plant, as there have not been enough studies conducted in humans that show that the benefits of cannabis overshadow the risks associated with its use. However, evidence and studies have suggested that cannabinoids in cannabis can be used to treat many medical conditions. In fact, cannabinoids are also produced in the body and have many important roles in memory, concentration and thinking, awareness of time, body movement, pain, appetite, and the senses.⁹

The use of cannabis for medicinal purposes started in China and then spread to Asia, the Middle East, Africa, and later the rest of the world. In 2737 BC, the emperor of China, Shen Neng, prescribed the drug for the treatment of several illnesses and ailments, including rheumatism, constipation, and "absentmindedness". In Egypt, in 1213 BC, cannabis pollen was found on the remains of Ramesses II, and it is said that it was used in the treatment of glaucoma, and inflammation.¹⁰ In India, bhang – a cannabis drink, prepared by mixing the leaves, flowers, and stems of the cannabis plant with a either yogurt or milk – was used to treat sunstroke and dysentery, and to improve digestion and other stomach ailments. In 70 AD, Pedanius Dioscorides, a Greek physician, cited in his book "On Medical Matters" that a juice made of cannabis leaves were used to treat earaches.¹¹ In the early 19th century, Irish physician William Brooke O'Shaughnessy popularized the usage of cannabis in England and America and used cannabis to ease the pain of rheumatism and in cases of rabies, cholera, and tetanus.¹²

Currently, THC and CBD are the two main cannabinoids that are found to have medical importance. It has been observed that THC increases appetite and reduces nausea, and it also helps with muscle-control problems. CBD also decreases inflammation and pain and can reduce epileptic seizures; it can be used to treat addictions and mental illness. Preclinical and clinical trials are in progress in these areas.

Dronabinol and Nabilone are two synthetic drugs of THC approved by the US FDA.¹³ They are used to treat nausea and vomiting for patients undergoing chemotherapy who are not responding to other anti-emetic treatments. They also help relieve pain, and are also used to increase appetite in people suffering from weight loss due to AIDS. Dronabinol is manufactured by Unimed Pharmaceuticals, a subsidiary of Solvay Pharmaceuticals, under the trade name Marinol. Nabilone is produced by Valeant Pharmaceuticals International under the trade name Cesamet. Apart from the US, Germany has approved Dronabinol, and Nabilone has been approved by the United Kingdom (UK), Austria, and Mexico. These synthetic drugs have standardized THC concentrations, as in natural cannabis, but do not contain several other compounds that are found in natural cannabis. The mouth spray nabiximols (Sativex®) manufactured by GW Pharmaceuticals is the first plant-derived cannabinoid prescription drug, and is used to treat muscle-control problems associated with MS. It has been approved by the UK, Canada, and several European countries.^{14,15}

Several studies have discovered the usefulness of cannabis in treating many other medical conditions. Studies conducted by Bastyr University, in Washington, and University of Colorado in Aurora found that cannabis helps patients with Parkinson's disease by reducing pain and tremors and improving sleep.¹⁶ These benefits can be attributed to the muscle-relaxing and analgesic effects of cannabis. A study by British drug maker GW Pharmaceuticals found that Epidiolex, an oral solution of pure plant-derived CBD, can reduce symptoms of severe seizures in children suffering from Dravet syndrome; the drug has decreased seizures from 40 per day to less than one per day on average. The FDA is scheduled to make a decision on Epidiolex by June 27, 2018. However, an FDA advisory committee has already recommended that the drug be approved. Market research firm Evaluate Pharma expects Epidiolex to be one of the 10 biggest new drugs launched in 2018, with sales of around \$1 billion by 2022.¹⁷ The 1975 study "Mar-

ihuana Smoking and Intraocular Pressure” concluded that cannabis is also used to treat and prevent glaucoma (an eye disease), helping to slow the progression of the disease, decreasing pressure inside the eye, and preventing blindness.¹⁸ Furthermore, according to researchers at the Salk Institute, a renowned biomedical research facility in California, cannabis can help treat Alzheimer’s by slowing the formation of amyloid plaques and by blocking the enzymes in the brain that make them.¹⁹ Cannabis also helps treat Fragile X syndrome (a genetic disorder) by reducing symptoms such as anxiety, temper tantrums, and hyperactivity; a cannabis-derived gel produced by Zynerva Pharmaceuticals proved this in a mid-stage study.²⁰

In addition to its ability to treat side effects of cancer and chemotherapy, studies have shown that cannabis extracts are effective against cancer. Dr. Christine Sanchez of Complutense University in Madrid, Spain, was the first to find out that cannabis has antitumor effects. She has been studying the effects of cannabis on cancer since the early 2000s. Sanchez has discovered that THC can kill brain tumor cells in lab dishes. Her study conducted on animals has shown that cannabis can be used to treat breast cancer. She and her group of researchers have also shown that the effect of cannabinoid-based treatment is enhanced when THC and CBD are used together.

Today, a large body of evidence suggests that cannabis can be effective against cancer. Some recent studies conducted in animals in laboratory conditions have shown that marijuana extracts can kill certain cancer cells and reduce the size of others. A cell culture study on rodents has shown that purified cannabis plant extracts can slow cancer cell growth in advanced brain tumors. Another study conducted on mice has shown that THC and CBD can increase the effectiveness of radiation in killing cancer cells. Dr. David Meiri – the lead researcher of a project involving the study of the effect of 50 varieties of cannabinoids on 200 types of cancer cells – has killed breast and brain cancer cells with cannabis and expects to find more varieties of cancer cells that will respond to the treatment. A 2007 study on THC by Harvard Medical School has found that it is effective against lung cancer. One advantage of a cannabis-based treatment is its ability to kill cancer cells without harming the nearby normal cells. Chemotherapy, on the other hand, cannot be targeted only at cancer cells.^{21,22,23}

Medical cannabis also has the potential to fight the opioid epidemic in the U.S. Over 100 million Americans suffering from chronic pain depend on opioid painkillers such as Vicodin. According to the Centers for Disease Control and Prevention, opioid overdose contributed to more than 33,000 deaths in 2015. In April 2018, the FDA called for a ban on Opana ER, an opioid painkiller, for public health reasons.

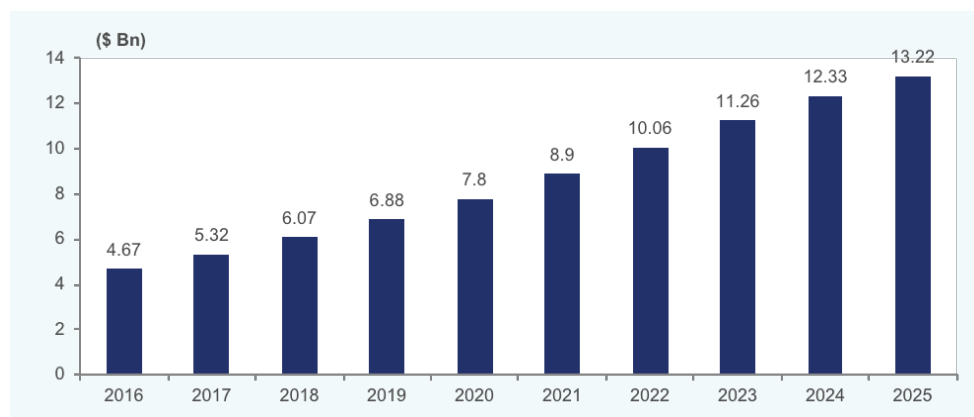
Cannabis derived drugs are increasingly being considered as a replacement for opioids because they are less-addictive and possess no risk of overdose. Multiple prominent studies have shown that U.S. states that have legalized medical marijuana have reported fewer opiate-related deaths and no deaths related to marijuana overdose. In 2017, the American Journal of Public Health published a study wherein it found a 6% drop in deaths related to opioid drugs after Colorado legalized marijuana for recreational use. In 2016, the American Medical Association published in a journal its observation of a 25% fall in opioid-related deaths in states that had legalized medical cannabis. Another study conducted by the Columbia University in 2015 found that smoking medicinal marijuana helped patients reduce the severity of withdrawals related to heroin abuse or the use of prescription painkillers. Although there are no FDA-approved marijuana-based painkillers, a handful of drug manufacturers (such as Axim Biotechnologies Inc., Nemus Bioscience Inc., and Intec Pharma Ltdare) are taking their first steps to develop marijuana-based painkillers – alternatives to opioids. These firms’ drugs are in various stages of development.^{24,25}

Market Outlook

According to Grand View Research, the global cannabis market was estimated at \$11.4 billion in 2015 and is expected to grow at a CAGR of around 17% and reach \$55.8 billion by 2025. With increasing awareness of the medical applications of cannabis and medical use becoming legal in more states in the US, the medical applications of cannabis are expected to increase. This, together with recreational uses, is expected to be the main driver of cannabis demand. The growth in cannabis-related research and development activities is also expected to affect demand.

Chronic pain was the largest segment of medical cannabis applications in 2015 and accounted for 39.6% of revenue. The highest growth in applications, however, is expected to come from the cancer segment, with a CAGR of 18.2% over 2015-2025, mostly from North America and Europe. In 2015, North America had a 49% share of the medical cannabis market, and with expected growth at a CAGR of 22.0%, it is expected to be the fastest-growing medical use of cannabis for the period between 2015 and 2025.^{26,27} According to New Frontier Data, the U.S. medical cannabis market, valued at \$4.67 billion in 2016, is expected to grow at a CAGR of 12%, to reach \$13.22 billion by 2025.²⁸

US Medical Cannabis Sales



Source: New Frontier Data, 2017

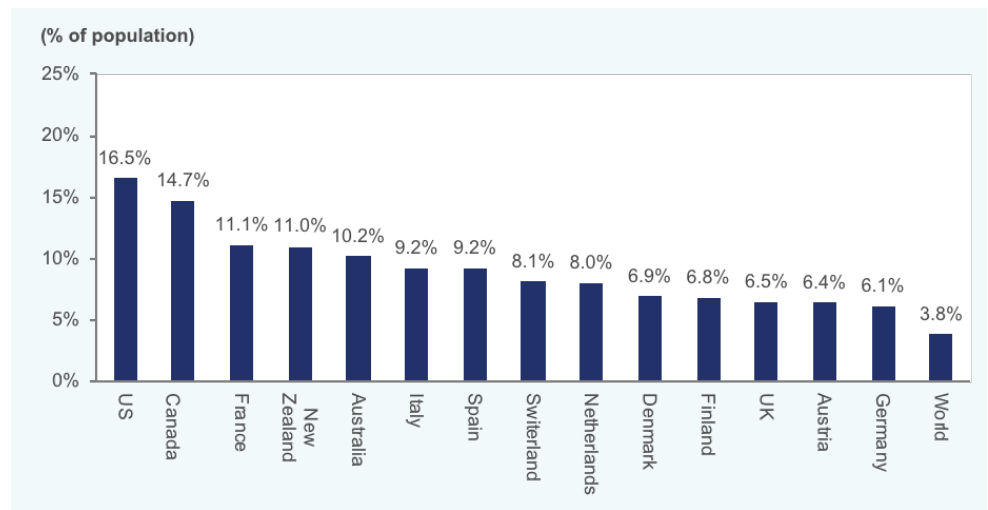
Recreational Uses

Cannabis is the most popular recreational drug in the US. The most prevalent and quickest method of cannabis consumption is through smoking. Vaporizing (vaping) is very similar to smoking, with the difference being that vaping heats the marijuana rather than burning it. Cannabis is also consumed through drinks, food, and sprays.^{29,30}

Various reports have suggested that the younger generation is moving from alcohol to cannabis mainly owing to safety, cost, and health. Cost wise, the average cost of alcohol exceeds the overall cost of cannabis, an incentive for people to prefer cannabis. Health reasons also make the younger generation move toward cannabis; with the popular opinion that the effects of alcohol last the next day, while the effects of cannabis last a few hours.^{31,32,33}

Currently, recreational cannabis is legal only in a few countries; however, with increasing liberalization, the recreational cannabis market is expected to grow in the long term. One of the main reasons for governments to legalize cannabis is that it can generate huge tax revenue.³⁴ Moreover, switching illegal users to legal consumers would reduce crime rates. Opponents to legalization point to the issue that legalizing recreational cannabis use would decrease the social stigma around cannabis, hence a large number of non-cannabis users might begin to use cannabis for recreational purposes. According to the United Nations Office on Drugs and Crime (UNODC) 2015 estimates based on annual report questionnaire data and other official sources, 183.3 million people consume the drug for recreational purposes; this is around 3.8% of the world's population. US and Canada are the major economies where the use of the drug is the most prevalent.^{35,36}

Prevalence of Adult Users of Recreational Cannabis



Source: UNODC, 2015

Market Outlook

In the US, Americans spent over \$1.89 billion on legal recreational cannabis in 2016. While the sales of legal recreational cannabis have continued to grow steadily, the projected sales numbers are impressive. Legal marijuana (recreational) sales are expected to reach \$10.86 billion in 2025, growing at a CAGR of 21% from 2016 to 2025. Public support for legalized recreational marijuana continues to rise in the US. In a survey conducted by New Frontier Data, 63% of the respondents expressed that the federal government should legalize cannabis, and 86% agreed that cannabis has valid medical uses.³⁷

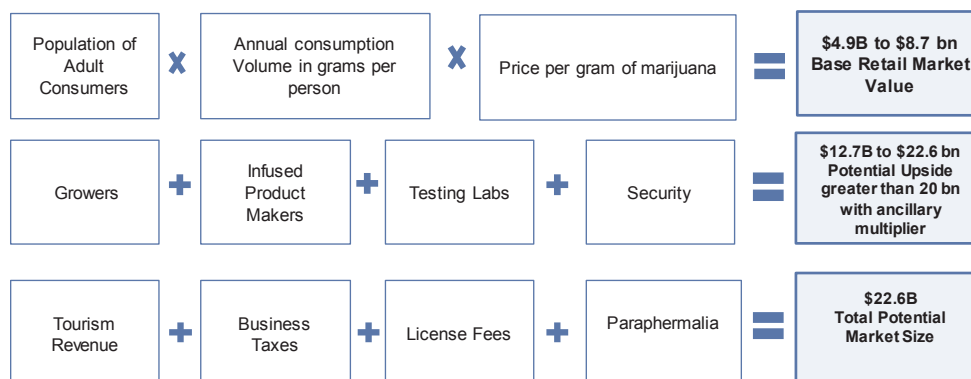
US Recreational Cannabis Sales



Source: New Frontier Data, 2017

Canada is the first G7 country to make cannabis legal for recreational purposes, and the legislation is expected to be in full effect on July 1, 2018. According to Deloitte Canada, the market size of illegal Canadian recreational cannabis is \$4.9-8.7 billion, with a potential to increase to more than \$22.6 billion with legalization. According to Stats Canada survey, in 2015 3.6 million Canadians (12% of the population) have used cannabis in the past two year, 9% in the past three months, and 3% in the past month. The government has stated that it expects this figure to increase with the legalization of cannabis, encouraging previous non-cannabis users to try it.

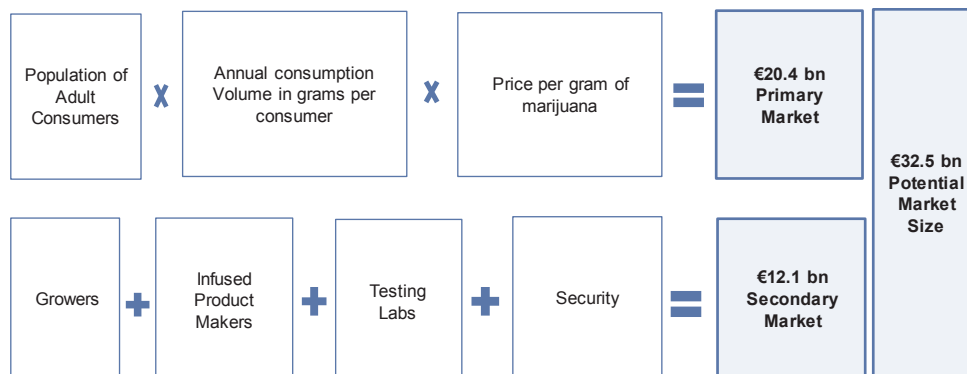
Canada Recreational Cannabis Market



Source: Everblu Capital, 2017

In Europe, cannabis has the largest market share of illegal drugs, worth over \$40 billion. There are more than 140 million active cannabis consumers in Europe, out of a population of 739 million people, and they purchase cannabis illegally. The recreational cannabis market in Europe is estimated at €32.5 billion. Factors such as a reduction in crime, new job opportunities, and higher tax revenue contribute to a greater support for the legal recreational cannabis market in Europe. However, there are some key considerations when it comes to how the industry develops and attracts investments owing to Europe's population and diversity. Europe's population is twice the size of that of the US and Canada combined, but it is a very small area, comprising 50 countries with 23 official languages. These factors are leading to a complicated regulatory and business environment that will be very different from other progressive cannabis markets around the world.³⁸

Europe Recreational Cannabis Market



Source: Everblu Capital, 2017

Industrial Uses

Hemp is a variety of the Cannabis sativa plant grown specifically for its industrial usage and is typically found in the northern hemisphere. It is one of the first plants to be spun into usable fiber 10,000 years ago. Industrial hemp usage dates to the Neolithic age in China, where it was refined for various industrial uses, including paper, textiles, biodegradable plastics, biofuel, and food.³⁹

Current Industrial Applications

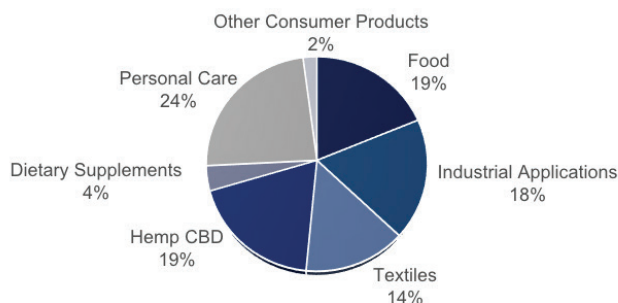
Hemp is currently used to make a wide variety of products, ranging from clothing, food, and beverages to fuel, consumer products, and building products, and it is also used for cleaning up soil pollution. The fiber from the hemp plant is used to manufacture a range of textiles – including shoes, jeans, lingerie, and sports clothing – as well as food and beverages, in the form of oil, dietary supplements, beer, wine, and other alcoholic beverages. For building material, hemp is used to manufacture fiber board, press board, and hempcrete (a stronger, lighter, and sustainable type of concrete). In the Netherlands and Ireland, hemp is being used for building insulation. Hemp is also used as a feedstock for plastic production. Most importantly, hemp oil could be processed and used as biodiesel. Companies such as Ford Motors, Patagonia, and The Body Shop use hemp as raw material to manufacture a wide range of products.^{40,41}

Market Outlook

Over the past decade, farmers, green consumers, and nutritionists have had considerable interest in hemp. Estimates from the Hemp Business Journal show that the total retail value of hemp products in the US was \$688 million in 2016 and expected to be \$1.8 billion by 2020, a 22% CAGR, driven mainly by hemp foods and personal care products. Out of this \$1.8 billion, around \$450 million in sales will derive from hemp CBD (an increase from \$90 million in 2015), one of the hottest hemp products in the market now. CBD derived from hemp is legal to import and purchase in all 50 US states.⁴²

(Note: Refer the recent developments section at the end of the document to read about the proposed Hemp Farming bill 2018)

US Hemp Sales by Product Type in 2016



Vote Hemp, Hemp Business Journal, 2017

Legal/ Regulatory Issues

Regulation in the US over the Years

In the US, at the start of the 20th century, cannabis was used mainly for medical purposes rather than for recreation. Therefore, the production and consumption of cannabis was regulated by consumer safety laws, such as the Pure Food and Drug Act of 1906, which required producers to disclose the quantity of cannabis present in any food or medicine they sold.

In 1937, the US Congress passed the Marijuana Tax Act, which required cannabis producers to register with federal authorities and pay taxes. The act was not an outright ban on cannabis, rather it outlawed the possession or sale of marijuana without registration⁴³ and made its use for recreational purposes illegal. Though the production and consumption of cannabis for medical purposes was not illegal under the act, the administrative formalities made its medical use practically impossible. It also became economically less viable to produce, import, and export hemp for industrial purposes under the act.

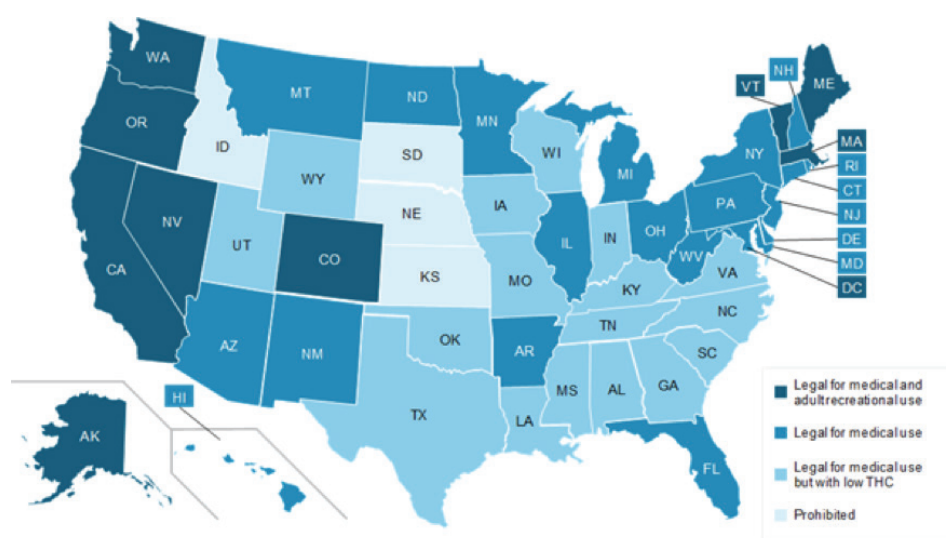
The complete ban on the use and possession of cannabis for all purposes came in 1970 with the passing of the Control Substances Act. The act placed cannabis in the Schedule 1 category – the most restrictive category for substances that have zero medical use, high potential for abuse, and a lack of safety – making cannabis one of the most dangerous substances to transact in attracting the highest penalties. The act is still in place, making the use of cannabis illegal under federal law.

The use of cannabis is currently regulated in the US under local, state, federal, and international laws. Though most state laws reflect the federal laws, there have been some changes in cannabis regulations at the state level over the past 50 years owing to a change in public opinion. These regulations have been driven mainly by three policies implemented by state governments:

- **State-Level Decriminalization throughout the 1970s:** Each state has its own set of rules and regulations regarding the use and supply of cannabis. During the 1970s, about a dozen US states reduced the penalties for the personal use and possession (decriminalizing) of cannabis, starting with Oregon in 1973, which reduced the penalty for up to one ounce to a \$100 fine. Minnesota in 1976, Mississippi in 1977, New York in 1977, Nebraska in 1978, and several other states followed suit to decriminalize cannabis. As of April 2018, 21 states and the District of Columbia (DC) have either legalized or decriminalized non-medical cannabis (9 legalized and 13 decriminalized).⁴⁴
- **Medical Cannabis Laws:** The enactment of medical cannabis laws in many states was another major point of change for cannabis law in the US. In 1996, California became the first state to legalize the medical use of cannabis. As of April 2018, 29 states and DC have legalized medical cannabis, allowing the use of the cannabis plant or products derived from the plant for medical purposes; 14 states have achieved this through voting, and 15 of them by passing laws in state legislature. Another 17 states have approved the limited use of low-THC, high-CBD products, such as cannabis oil for medical purposes.⁴⁵ Some state laws are more restrictive than others, limiting the use of cannabis to individuals who suffer from certain illnesses or limiting its production and distribution.
- **Regulated Recreational Cannabis:** There have been efforts by some states to legalize the recreational use of cannabis for adults. In 2010, California be-

came the first state to vote to make recreational cannabis legal for people over the age of 21. The initiative, however, failed, with 54% of people voting against it. In November 2012, the production of cannabis for recreational use for people over 21 was legalized in Colorado and Washington. Soon after, other states followed suit, with similar ballot measures to vote to legalize recreational cannabis. As of April 2018, recreational use of cannabis is approved in nine US states and the District of Colombia. Vermont became the first state to legalize cannabis through legislative action; the recreational use of cannabis became legal on January 22, 2018. In all other states, it was through voter initiatives.

In summary, as of April 2018, cannabis products are legal for medical purposes in 29 states and the District of Colombia and for limited use in 17 more states. For recreational purposes, it is legal in nine states and the District of Colombia.⁴⁶ The federal government has not challenged these states laws, as under the 10th amendment, the federal government cannot force a state to criminalize a particular act.⁴⁷ However, none of these products have been approved by the US FDA, and the use and possession of cannabis for any purpose is illegal under federal law.



Vermont adult use law signed Jan 22, 2018, Effective July 1, 2018
Limited adult possession and growing allowed, no regulated production of sales: DC, VT

Source:
<http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx#Table2>
https://en.wikipedia.org/wiki/Legality_of_cannabis_by_U.S._jurisdiction

Legislation across the Globe

At the international level, cannabis is considered among the most dangerous substances (leading to dependence and a serious risk of abuse) and to have limited or little medical value, and it is regulated under the provisions of three major international drug treaties; the Single Convention on Narcotic Drugs of 1961, the Convention on Psychotropic Drugs of 1971, and the United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988. According to these treaties, the participating countries should prohibit the use of all illicit drugs other than for medical and scientific purposes and prohibit its recreational use and sale. Most of the country laws on drugs are shaped by the provisions of these treaties.^{48,49}

There is no harmonized law in the European Union (EU) on the use of cannabis. Criminal and administrative actions against its usage are the responsibility of individual countries and not that of the EU. There is broadly two ways in which EU countries consider offenses related to cannabis. Some countries legally treat cannabis like all other drugs, whereas, in other countries, it is treated differently from other drugs, and penalties vary according to the damage the drug can cause.

Despite these individual differences, the penalties for cannabis-related offenses are less severe compared to other drugs across the EU, and the trend since the late 1990s has been to reduce penalties for cannabis-related offenses. However, no countries have removed the penalties, and none of the EU countries support the legalization of recreational cannabis.

Nevertheless, the medical use of cannabis is allowed in the EU. Cannabis-based medicines are approved at the EU or country level. It is also legal to grow and supply cannabis for hemp fiber for industrial purposes if the THC content in the plant is low and does not exceed 0.2%.

Germany is the largest medical cannabis market in Europe, and the national parliament has recently approved a new medical cannabis bill. The aim of the bill is to make medicinal cannabis available to seriously ill patients throughout the country. Moreover, the bill will ensure that medical marijuana will be produced in Germany at the highest quality possible, and the drug will also be covered under the country's health insurance.

In the UK, medical cannabis is illegal, with the exception of rarely prescribed GW Pharmaceuticals' Sativex. In Spain, cannabis production for recreational and medical use is decriminalized, provided it is for personal use and in a private place. However, the purchase, possession, and consumption of cannabis in a public place is illegal. Italy and Poland are other European countries where medical cannabis is legal.⁵⁰

In October 2016, Australia passed legislation to legalize the production of cannabis for medical and research-related purposes. Under this framework, the Commonwealth has overall control of the production of cannabis, while the state government can introduce laws to cover manufacturing, supply, and use of cannabis.

Canada is one of the first countries to legalize recreational marijuana, with effect from July 2018. Though the legislation is not yet finalized, it will be similar to current tobacco legislation. It will focus on common public health objectives, enhancing public awareness of cannabis, smoking restrictions in certain areas, etc.

Israel, a world leader in medical cannabis research and development, approved medical marijuana in 1999 for people with a license from the Ministry of Health. The Israeli government is supporting and funding research on cannabis medical uses and has approved more than 150 research proposals. Around 50 US companies have invested over \$125 million in Israeli cannabis research programs. Recreational cannabis is not yet legal in Israel; however, steps are being taken to decriminalize it.⁵¹

Banking Issues in the US

Despite cannabis being legal for medical use in 29 US states and for recreational use in 9 states, business owners in this \$8 billion industry still feel the pinch. They are limited to cash transactions (such as depositing money, receiving insurance, or paying taxes) as they are not able to access banks due to cannabis' classification as a Schedule I drug by the US FDA (alongside heroin, LSD, etc.). This classification prohibits everyone, including banks, from dealing with the drug's proceeds.

In the U.S., Banks are governed by federal laws, and doing business with firms involved in cannabis business means strict scrutiny and significant costs, as banks have to conduct their own due diligence to prove that the transactions are legal. Banks need to prove that the companies are not selling cannabis to minors or crime groups and are not using the legalization of cannabis to sell other illegal drugs. The Bank Secrecy Act requires banks to watch for anti-money laundering, and the government requires banks to file a suspicious activity report to the Financial Crimes Enforcement Network (FinCEN); an agency of the US Treasury. As cannabis is illegal under federal law, it immediately raises concerns about money laundering. To comply with the federal "Know-Your-Client" rules, banks need to understand customers' businesses, and when customers such as cannabis businesses take part in federally illegal activities, banks can suffer severe penalties.

Moreover, all banks and credit unions use the Federal Reserve System for transferring funds, check-clearing, and other facilities, putting financial institutions under the scrutiny of federal financial regulatory agencies if they make a transaction for a cannabis business. Finally, the attorney general opposes state cannabis legalization and has asked Congress to lift restrictions against prosecuting businesses and individuals that comply with state cannabis laws, thus turning federal policy more hawkish.⁵²

Legalizing cannabis banking in US states has some benefits, including reducing the crime and threats that stem from the cash nature of the cannabis industry. Tax collection through cash may not be completely accurate, and in an era where taxes for all businesses are paid online and through cell phones and chip cards, cannabis businesses are far behind. Taxes collected by the government must be counted, stored, and transported to the financial institution, which is a very time-consuming process. The increase in expenses, such as staff time, security, and facilities management, makes this a very costly method to collect tax revenues. Allowing banks to provide banking facilities to the cannabis industry will also establish the industry as a transparent, well-regulated tax-paying business in cannabis-legal states.⁵³

Current Tax Data in the US

A study by a data analytics firm focused on the cannabis industry has shown that if cannabis is legalized across the US, it will generate over \$132 billion in tax revenue and more than 1 million jobs across the country between 2017 and 2025.⁵⁴

As Colorado was the first state in the US to legalize recreational cannabis, its market is the most mature. According to a pro-legalization research company, cannabis-related tax revenues in Colorado increased from \$76 million in 2014 to \$200 million in 2017. In January 2014, the retail sale of cannabis started in Colorado, and by 2017, the state had collected \$506 million in cannabis-related tax revenue, most of it from recreational use. Colorado has a 2.9% sales tax on medical cannabis, plus license and application fees. Recreational cannabis is more heavily taxed, with an excise tax of 15% and a special sales tax of 10%, plus license and application fees that are in addition to the 2.9% sales tax. In 2017, recreational tax revenue from cannabis amounted to \$256 million in Washington and \$60 million in Oregon.⁵⁵

Big Tobacco Connection: The Tobacco Industry's Potential to Enter the Cannabis Market

Now that demand for cigarettes is declining in developed countries, tobacco giants are attempting to become involved in the cannabis business as it becomes more acceptable and regulated. Big tobacco giants have already entered the e-cigarette business owing to the huge crossover in e-cigarette use. The alternative products; e-cigarettes and vaporizers (also known as vapor e-cigarettes), use a technology that could be easily replicated with cannabis. Vaporizers are preferred by marijuana users as they offer a higher high. With the legalization of marijuana, the demand for e-cigarettes is expected to rise as smokers might opt to use vaping products, such as the e-cigarette, rather than the traditional method of smoking marijuana. In 2017, e-cigarette sales amounted to \$5 billion annually, compared with \$92 million for cigarette sales, and this figure is expected to grow at a CAGR of 24% in 2018. A study from the University of Florida has suggested that two out of three marijuana users prefer to consume the drug with a vape pen/e-cigarette.⁵⁶

In 2014, Altria Group acquired Green Smoke, an e-cigarette manufacturer for \$110 million, and Reynolds America launched its own e-cigarette vaping brand, VUSE. Similarly, British American Tobacco, the largest tobacco company in Europe, launched its own e-cigarette brand, Vype.⁵⁷ In 2016, Philip Morris invested \$20 million in Syqe Medical, an Israeli firm that develops new technology to inhale medical marijuana. Cross-border M&A is also occurring, including Japan Tobacco International's acquisition of Logic Technology Development LLC, the third-largest e-cigarette firm in the US.⁵⁸

Major tobacco companies are also investing directly in the cannabis industry. Canadian Cultivated Products Ltd, a wholly owned subsidiary of Alliance One International (a US tobacco company), has acquired 75% of Canada's Island Garden and 80% of Goldleaf Pharm, two Canadian marijuana producers. This is the first significant transaction into the cannabis industry by a leading tobacco company.⁵⁹

Stealth Ways That the Tobacco Industry Is Already Involved in Marijuana

In June 2017, tobacco giant Imperial Brands appointed Simon Langelier, the chairman of a Canadian medicinal cannabis oil supplier, as a member of its board of directors. Earlier, in 2015, the company dropped the word "tobacco" from its name, after operating in the industry for over a century. These actions are a possible sign of diversification in product offering, including an entry into the cannabis space.⁶⁰

In January 2018, Philip Morris International, in an attempt to rebrand itself, announced that it aims to stop selling cigarettes in the UK as it plans to push its smokeless alternatives. Reynolds, similar to Philip Morris, also sells e-cigarettes, under its brand Vuse. Moreover, increased use of cannabis could also be an advantage for rolling paper manufacturers such as Turning Point Brands, a leading provider of tobacco products in the US that owns Zig Zag, a rolling paper maker.^{61,62,63}

An Analysis of the Tobacco Industry's Current Business Model and How This Relates to Marijuana upon Federal Legalization

The two most extensively cultivated varieties of tobacco are cultivated tobacco (*Nicotiana tabacum*) and wild tobacco (*Nicotiana rustica*). Since tobacco plantations require a frost-free growing season of 100-130 days, the tobacco plant is cultivated within 50 degrees latitude of the equator.⁶⁴

Growing: Initially, tobacco is grown in outdoor frames known as seedbeds. It takes about 8-10 weeks for the seedlings to grow roughly 10 inches (25 cm) tall, when they are transplanted to fields either through machines or manually. The plants stay in the field for approximately 90-120 days before harvesting.⁶⁵

Harvesting: Once ripe, tobacco is harvested in two ways: either leaf by leaf or by cutting the plant all at once. In the first method, each leaf has to be picked at the right ripeness. Whereas in the second case, the plant is harvested at an average ripeness. Harvesting at just the right time is very important for cigar tobaccos and wrappers.⁶⁶ After harvesting, the leaves are moistened, stripped, sorted, and finally auctioned to cigarette manufacturers.

Tobacco leaf farmers generally sell their harvest under the contract system to big tobacco manufacturing companies. These companies require farmers to follow certain agricultural practices to maintain the quality of the output. For instance, Philip Morris sources high-quality tobacco from leaf suppliers and farmers from 30 countries across the globe.^{67,68}

Manufacturing: Cigarette manufacturing companies treat and age tobacco to enhance its flavor and aroma. Post aging, tobacco leaves are pressed into cakes and are mechanically shredded. Manufacturers add fruit juices or menthol for additional flavor. Finally, the shredded tobacco is then dispersed over a continuous roll of cigarette paper, where a machine rolls the tobacco into the paper and cuts it to the required length.⁶⁹

Packaging: In the final stage, the cigarettes are placed in packs, which are then mechanically sealed in cellophane and hand-placed in cartons.⁷⁰

Distributing network: Manufacturers generally do not place their products directly in the market but sell them to wholesalers and distributors.⁷¹

Marketing: The tobacco industry spends billions of dollars to market its products through various ways, including attractive packaging. In 2015, tobacco companies spent \$8.9 billion on advertising and promotional expenses in the US.⁷²

If recreational marijuana becomes legalized across the US, big tobacco companies will be impeccably positioned to capture this vast and nascent market. The tobacco industry, which has been around for over a century, is the closest analog to the current cannabis industry, as tobacco companies are better capitalized, more mature, and know how to grow and harvest a plant en masse given their involvement in growing, processing, shipping, and distributing tobacco products. They also have marketing organizations to target significant markets, such as California, which is expected to be the largest legalized marijuana market.⁷³

Until the passage of the Family Smoking Prevention and Tobacco Control Act (2009), the tobacco industry was essentially unregulated in the US. Therefore, as an industry, it has transformed from being a socially and legally acceptable industry to a heavily regulated one. The marijuana industry, on the other hand, is fighting its way from being illegal and having a social stigma to deregulation.

In terms of market structure, the tobacco market in the US is essentially an oligopoly, with the top-three companies together holding about 90% of the market share. The barriers to entry are immense, especially owing to the FDA's slow and expensive process for new product approvals. Conversely, the marijuana industry is highly fragmented with negligible entry barriers.

The tobacco industry is reporting poor growth in terms of volumes; industry giants, such as Philip Morris, are performing sluggishly owing to declining global smoking rates. However, the marijuana industry is growing rapidly; the Brightfield Group expects the industry to grow at a CAGR of 60%, reaching \$31 billion.^{74,75,76}

According to an investigation by Daily Caller News Foundation, tobacco conglomerates might enter into the growing marijuana business if the drug wins legal status across the US.⁷⁷

Marijuana represents a vast nascent market for big tobacco companies who are pumping millions of dollars into e-vaporizers, commonly known as e-cigarettes. Owing to prior expertise, the ability to source quality inputs, and operational synergies between the two industries, it would be prudent for big tobacco players to enter the marijuana industry. For instance, tobacco wholesalers in Massachusetts have asked state officials to make it mandatory for marijuana producers to sell all their products through them. The industry players argue that they have expertise in handling a sensitive product throughout the supply chain. Their sophisticated tracking technology prevents the bootlegging and smuggling of tobacco and also enables the system to verify whether the product has been sourced through legitimate channels. They claim that by replicating the same system for the marijuana industry, the black marketing of marijuana could be prevented.^{78,79,80,81}

Comparison of the Tobacco Industry with the Marijuana Industry

Ease of the Tobacco Industry's Entrance into Cannabis upon Legalization

Recent Developments

Hemp Farming Act 2018

In April 2018, the US witnessed some significant developments in the cannabis space that reflect a dramatic change in sentiment, possibly leading to a shift in the federal marijuana policy in the near future. Bipartisan lawmakers – such as Senate Majority Leader Mitch McConnell, Colorado’s Republican Senator Cory Gardner, and Senate Minority Leader Chuck Schumer – are advocating for marijuana legalization.

In April 2018, Senate Majority Leader Mitch McConnell introduced a bill, the Hemp Farming Act (2018). The bill would distinguish hemp from marijuana and remove industrial hemp (a non-intoxicating variety that contains less than 1% THC) from the Schedule I of the Controlled Substances Act and permit the public to grow and sell it as an agricultural product.

The bill is expected to extend the benefits derived from the 2014 Farm Bill, the provisions of which led 36 states to legalize hemp research. Legal status of industrial hemp would enable hemp farming to emerge as a steady business model as producers would be entitled to banking services, water rights, and crop insurance, all leading to growth in hemp production. The bill would empower states to be the primary regulators of hemp farmers and manufacturers, and the US Department of Agriculture (USDA) would help states formulate regulations. Additionally, the USDA would provide the necessary oversight if states were not able to come up with regulations or chose not to do so. This is a significant provision as this would prevent hemp from being put under more regulations by conservative politicians. In addition, researchers would receive access to grants from the USDA, which could spur further innovation in this field. The bill currently has seven co-sponsors.^{82,83,84,85,86,87}

The Gardner-Trump Agreement

In April 2018, Colorado’s Republican senator, Cory Gardner, struck a deal with President Donald J. Trump to protect Colorado’s marijuana legalization regime from federal interference. Colorado had legalized marijuana for recreational use in 2012. President Trump is also willing to support efforts to protect the states that have legalized marijuana by allowing them to decide how they want to regulate cannabis. Mr. Gardner, along with a few other senators, is working on a bipartisan legislative solution, which, if passed through Congress, could ultimately reach the president for his approval.^{88,89,90}

Ex-Speaker John Boehner Joins a Marijuana Firm’s Advisory Board

In April 2018, John Boehner, the former speaker of the House, and William Weld, the former governor of Massachusetts, joined the advisory board of Acreage Holdings, a company that cultivates, processes, and dispenses cannabis in 11 states across the US and holds 35 licenses for cannabis businesses. Mr. Boehner has historically opposed decriminalizing marijuana, and in 1999, he voted to prohibit medical marijuana as a US congressman from Ohio. He also supported the congressional blockade of DC’s recreational marijuana program in 2014. Recently, Mr. Boehner has expressed his opinion that the federal government should stop labeling cannabis a “schedule 1” drug equivalent to cocaine and heroin. He also expressed that de-scheduling cannabis could spur much-needed research in the field.^{91,92,93,94,95,96}

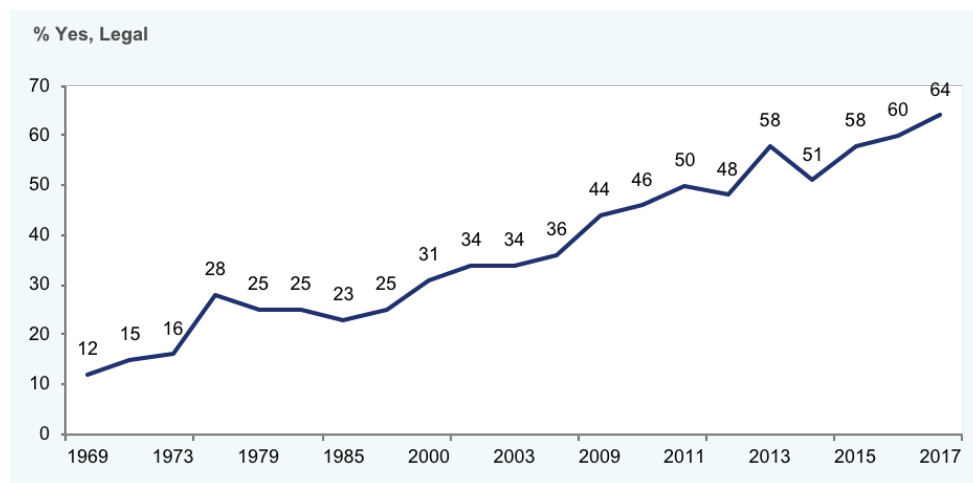
US Senate Minority Leader Chuck Schumer to Introduce a Bill to Decriminalize Marijuana at the Federal Level

In April 2018, Senate Minority Leader Chuck Schumer announced that he would soon introduce a bill to remove marijuana from the list of scheduled substances under the US Controlled Substances Act (1970), effectively decriminalizing marijuana at the federal level. The bill would help women and minority-owned marijuana businesses to receive funding and would also provide monetary support to research the effects of THC on public health. Most importantly, the authority to legalize and regulate cannabis would rest in the hands of states. However, the proposal would not completely dilute the ability of the federal government to enforce certain controls. For instance, federal regulatory bodies would still be able to penalize drug traffickers operating between legalized states and states that have not legalized marijuana. In addition, the authority over marijuana advertising would rest in the hands of the federal government to prevent marijuana businesses from targeting children.^{97,98,99}

States or Countries Contemplating Legalization

US Support for Legalizing Marijuana

Owing to the increasing awareness of the medicinal uses of marijuana and growing public support for the legalization of marijuana, more US states and some countries are lately moving toward legalization, especially for medical purposes. The below graph shows the result of polls conducted by Gallup in the US, over years, on views on legalization of marijuana.



Vote Hemp, Hemp Business Journal, 2017

In the US, apart from the 29 states and DC that have legalized medical marijuana and the 9 states and DC that have legalized it for recreational purposes, 12 states are contemplating legalizing marijuana: New Jersey, Michigan, Connecticut, Delaware, Illinois, Ohio, and Rhode Island (recreational marijuana), and Utah, Oklahoma, Kentucky, South Dakota, and Missouri (medical marijuana).^{100,101}

Australia legalized medical cannabis in 2016; however, possession of marijuana for recreational purposes is still illegal. In April 2018, the Australian Greens, a major political party, proposed a policy in favor of full cannabis legalization for Australians over the age of 18. The policy suggests that recreational cannabis be sold in plain packaging and wholesale distribution be monopolized by a new agency, the Australian Cannabis Agency. However, influential medical bodies in Australia – such as the Australian Medical Association, the Alcohol and Drug Foundation, and the Royal Australasian College of Physicians – have expressed concerns about the policy.^{102,103}

In April 2018, the New Zealand government passed a medicinal cannabis bill with undivided support for its initial reading. Under this bill, the government would offer a legal defense for terminally ill patients (those having 12 months or less to live). Under this bill, cannabis use would remain illegal but non-prosecutable. However, the New Zealand Drug Foundation has requested the government to widen the provisions of the bill to include patients suffering from severe and debilitating conditions. Moreover, New Zealand will hold a referendum by 2020 on the legalization of recreational cannabis.^{104,105}

In 2017, Mexico legalized medical marijuana while maintaining a strict ban on recreational use and cultivation. However, it plans to legalize the sale of marijuana-based products, such as medicines, foods, beverages, and cosmetics, in 2018. In 2015, Jamaica legalized medical marijuana, but recreational marijuana remains illegal; the Jamaican government has recognized legal cannabis as a serious industry that can grow the economy, and it is currently trying to make it easier for the legal cannabis industry to avail banking services. In the Netherlands, although marijuana is not legal, the government has decriminalized it for personal use; it is sold and consumed in small quantities in coffee shops. In April 2018, the Dutch government introduced a legislation to implement its legalization pilot program across 6-10 municipalities for about 5 years; the program is expected to begin by 2019.^{106,107,108}

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