



# Marijuana: Not Just Blowing Smoke

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## Executive Summary

It is estimated that roughly 7% of the world's population uses illicit drugs – and marijuana is the most commonly used illegal drug. [1] In the U.S., 17.5 million people have used marijuana in the last month. [2] Globally, legal approaches vary. Recreational use of marijuana is completely legal only in Uruguay and North Korea; however, many countries either do not typically enforce laws banning marijuana use or have decriminalized it. Further, many countries as well as several U.S. states are beginning to allow the use of marijuana to treat some medical conditions. A few U.S. states even allow the recreational use of marijuana and other cannabis products. As more governments, both in the U.S. and internationally, liberalize cannabis regulations, the effects of this drug on mortality and morbidity as well as its potentially positive impact when used for medicinal purposes will be a topic of significant interest for the insurance industry.

At this point, evidence is still inconclusive regarding the health risks of smoking marijuana. No deaths have been reported due to acute marijuana abuse, and no studies have clearly documented increased mortality from the use of the drug. On the other hand, the April 2014 issue of the Journal of the American Health Association points to a French study noting that marijuana use by younger people with risk factors for cardiovascular disease can lead to cardiovascular events and potentially death. [3] Additionally, a recent study found the risk of having a heart attack within an hour of smoking marijuana is five times greater than non-smokers' risk. [4] Further studies on this subject will be necessary to reach a definitive conclusion on the long-term health and mortality impacts of marijuana use.

Ultimately, the insurance industry will need to consider the underwriting implications of more widespread marijuana use brought about in part by changing legislation and societal norms. The primary focus in underwriting medical marijuana users will be on the medical condition prompting the use. Although the Food and Drug Administration's (FDA) list of approved conditions is quite limited, there are many approved conditions in states that now permit medical marijuana use. Key considerations in underwriting will include the frequency, purpose and admission of use, as well as the type of marijuana used, the applicant's age, history of accidents, risky behavior and other substance abuse.





## Introduction

With recent legislation passed by a few U.S. states legalizing recreational marijuana use and even more states having approved medical marijuana legislation, the interest in this drug continues to grow. A Pew Research Study completed in March 2014 indicated 48% of Americans admitted they have tried marijuana – the highest percentage ever reported in the survey's history. Of these users, 47% reported they had used it solely recreationally, 30% used it for medical reasons, and 23% used it for both medical and recreational purposes.

More than half of new illicit drug users begin with marijuana, with use highest among people in their late teens and twenties, and also increasing among people in their fifties. [5] Nearly 23% of respondents said they smoked it in the month prior to the survey. Another study referenced by the National Institute of Health in its 2014 summary demonstrated that continuous heavy cannabis use from the teen years through adulthood correlated with a significant drop in IQ between ages 13 and 38; teens who used heavily prior to age 18 showed impaired mental abilities even when they quit taking the drug. [6] [7] Further, the risk of addiction goes from about 1 in 11 overall to about 1 in 6 for those who start using in their teens. Those numbers are even higher among daily smokers. The National Survey of Drug Use and Health in 2012 estimated 2.7 million Americans aged 12 and older were marijuana-dependent.

Marijuana use is growing, and legislation is allowing its use for an increasing number of conditions, including recreational use in some locations. Therefore, it will be important for insurers to understand this drug and the impact it will have on their business, for mortality and morbidity results and underwriting and claims adjudication.



## Forms of Marijuana and General Drug Information

Tetrahydrocannabinol, or THC, is the primary psychoactive chemical in marijuana. THC is similar in composition to the body's naturally occurring cannabinoids, actively competing for cannabinoid receptors and causing normal brain activity to be influenced by its presence in the bloodstream. Thus it affects the body by targeting brain cells that respond to natural chemicals with a similar makeup. The areas of the brain controlling pleasure, thinking, memory, the ability to focus, sensory and time perception, and coordinated movement have high concentrations of these receptors. Consequently, these functions are affected the most by marijuana. Marijuana exposes these receptors to a much higher dose of chemicals than the body's natural production, thereby inducing the 'high' people experience from marijuana consumption. [6]

Marijuana can be used in several different forms that can be consumed in a variety of ways. It will be important for insurers to understand the various forms and delivery methods as well as their respective medical impact as states determine their own marijuana policies and the marijuana industry continues to develop. The most popular forms and delivery combinations currently are edible, such as candies, and herbal marijuana for smoking.

Edible marijuana is most commonly used in foods such as brownies, cakes and candy (e.g., gummy bears). More broadly, though, it can be incorporated in most any food or even brewed like a tea. [6] In fact, experimentation on marijuana-infused coffee is already underway in Washington. [8] THC, the main mind-altering chemical present in cannabis, must be extracted from the cannabis for the final product to be psychoactive. [9] When this is achieved in the cooking process, some sources suggest that marijuana-infused foods can provide a more efficient means of cannabinoid absorption than smoking marijuana. [9]

One major difference between smoking marijuana and consuming it in an edible form is the amount of time it takes for the cannabinoids to reach the bloodstream. Marijuana in food typically enters the bloodstream about one to three hours after ingestion, but this only takes three to 10 minutes when smoking marijuana. [8] Smoking marijuana causes peak levels of THC in the blood to occur much more quickly than oral ingestion; however, the high dissipates more quickly. [9]



Although the resulting high is similar between the two media once the chemicals reach the brain, the increased time for edible marijuana to take effect makes it much easier to overdose unintentionally, with potential consequences that include heart attacks and other cardiovascular problems. This may present an additional risk of medical complications and even death relative to smoking marijuana. For example, the amount of marijuana entering the bloodstream is affected by other factors, including food consumed and other drugs in the body at the time of metabolism. Additionally, the marijuana content shown on product nutritional information is often inaccurate. [8]

Form	Time to Feel Effects	Length of High
Edible	1-3 hours	Longer
Herbal (Smoked)	3-10 minutes	Shorter

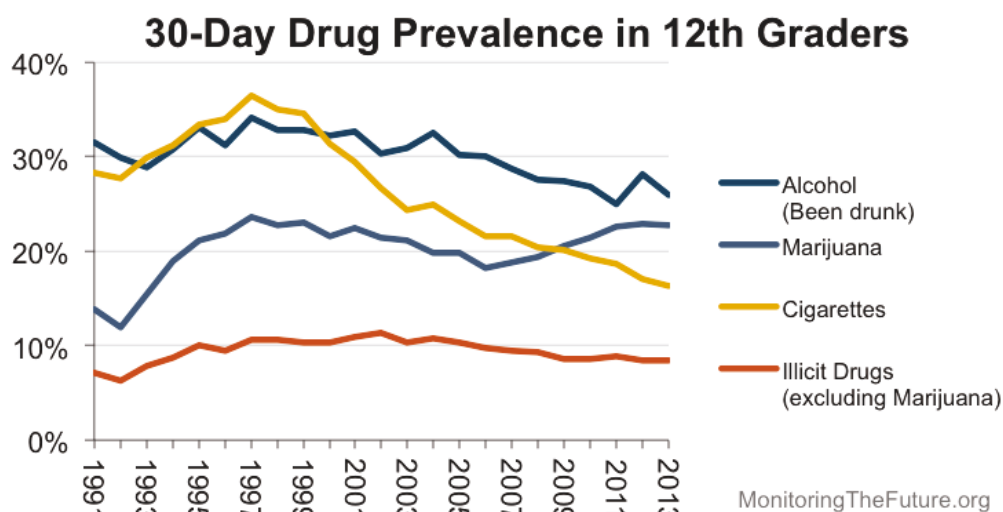
The most common form of marijuana consumption is smoking a “joint” – a hand-rolled marijuana-filled cigarette. [10] Marijuana can also be smoked in water pipes (aka bong), pipes and blunts, which are cigars that have been hollowed out and filled with marijuana. [10] Marijuana can also be consumed through smoking e-cigarettes containing hash oil. [11] Currently, opinions are mixed on the health consequences of smoking marijuana relative to smoking tobacco. The American Lung Association asserts that marijuana contains 33 chemical carcinogens, and that “marijuana deposits four times as much tar in the lungs” as smoking an equal amount of tobacco. [10] On the other hand, a recent 20-year study undertaken by the University of Alabama at Birmingham and the University of California, San Francisco – one of the longest and largest of its kind – suggests that in spite of the presence of many of the same toxic chemicals that make tobacco smoke harmful, smoking marijuana does not carry the same risk of lung disease as smoking tobacco. [12] As the maturity and availability of data on marijuana use improve, the conclusion regarding the relative health implications of smoking marijuana compared to smoking tobacco will become clearer.



## Trends

Already the most commonly used illicit drug in the U.S., marijuana is still growing in popularity. According to DrugAbuse.gov, there are 18.9 million marijuana users in the U.S. who have used in the past month. That is 7.3% of the population aged 12 or older—up from 5.8% in 2007. [6] Further, teens' perception of marijuana's harmfulness is down. The University of Michigan administers annual drug usage surveys in a program called Monitoring the Future. The most recent study of 12th graders (aged 17-18) found that marijuana usage has increased among youth in recent years as well. [13] The study also shows that there are now more marijuana users than cigarette users among 12th graders, and the number of marijuana users is catching up to the number of alcohol users (defined as consuming alcohol to the point of drunkenness). The study shows that marijuana users make up nearly 75% of illicit drug users. With teen marijuana use on the rise, it will become even more important to understand the risks of marijuana to determine the impact on the insurance market in the coming years.

Not only is the use of marijuana surging, but marijuana potency is increasing as well. Police

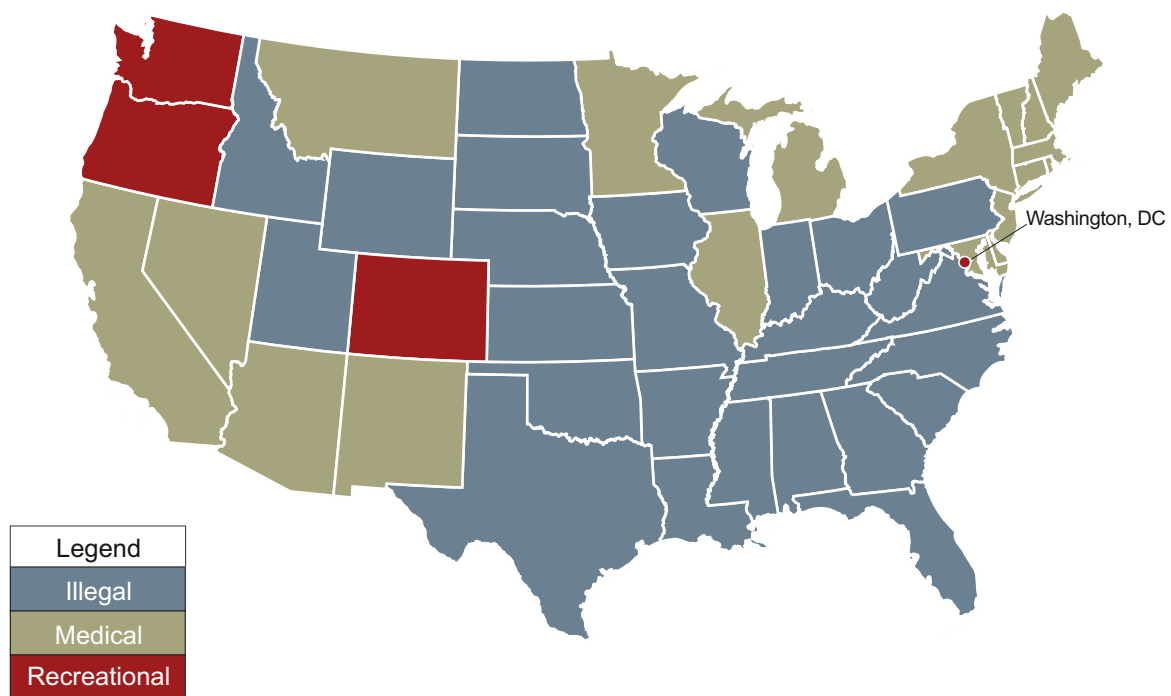


have found that the concentration of THC in confiscated marijuana has been increasing over the past few decades, from about 4% in the 1980s to nearly 15% today. [6] The increased potency could lead to greater risk of addiction and a more intense—and possibly more dangerous—reaction to the drug. While the side effects of marijuana are not fully understood yet, increased THC concentrations could escalate the effects. This increase in potency together with the increasing prevalence of marijuana use may help explain the 60% increase in emergency department visits due to marijuana use, from just over 200,000 in 2004 to more than 335,000 in 2011. [14]

## United States Legislation

There have been many changes to marijuana laws throughout the U.S. in recent years. As of October 2014, 23 states and Washington, D.C. have legalized medical marijuana. Additionally, the cities of Portland, Maine and Philadelphia, Pennsylvania have legalized medical marijuana despite contradicting state laws. Four of these states (Colorado, Washington, Oregon and Alaska) and the District of Columbia have also legalized recreational marijuana use (see map below). It should be noted, however, that federal law, which applies in every U.S. state, still classifies marijuana use as illegal. Commonly cited reasons for legalization include economic benefits such as increased tax revenue and decreased spending on enforcement, while proponents also point out the potential positive effects of medical marijuana use on certain health conditions. [15]

As with any potentially mind-altering substance, driving under the influence (DUI) of marijuana is a concern. In most states, driving under the influence of drugs falls under the same set of laws as driving under the influence of alcohol. This makes it very difficult to quantify the impact of DUI drugs relative to DUI alcohol on traffic accidents resulting in injuries and fatalities. Some states, however, do have language in these laws stating that the presence of any amount of illegal drugs or the chemical byproducts resulting from their metabolism is a criminal offense. [16]



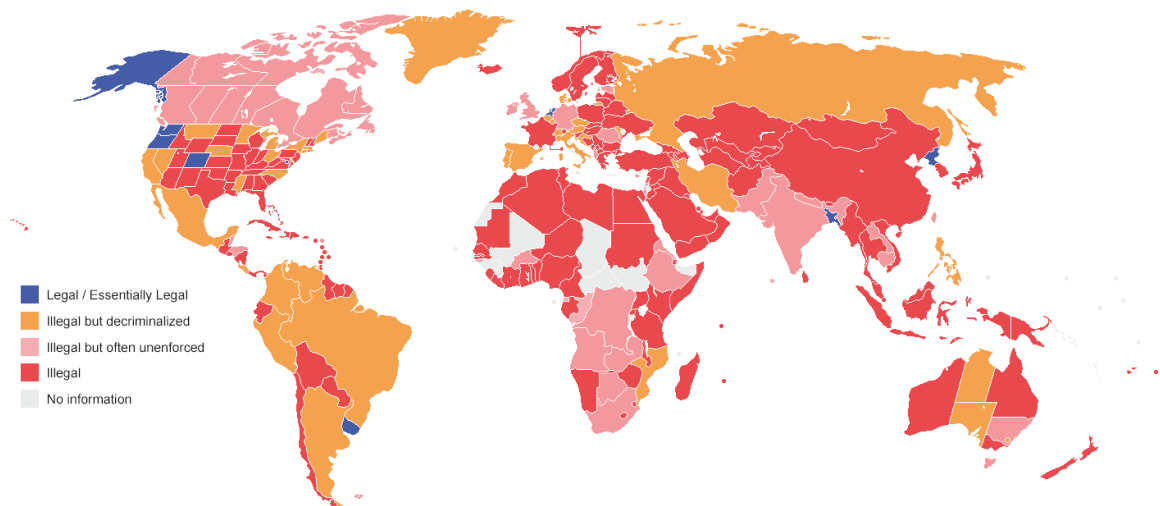
Source: U.S. Census Bureau (<http://www.census.gov/>)



## International Perspective

Recent estimates from the United Nations Office on Drugs and Crime (UNODC) put global illicit drug use between 162 million and 324 million people in 2012 – as much as 7% of the total population between the ages of 15 and 64. After increasing through 2010, cannabis use seems to be down globally in the last few years, caused primarily by decreases in estimated cannabis use in Western and Central Europe. Its consumption in North America – particularly the United States – is on the rise, largely due to changing public opinion about its risk. Existing research suggests a continued increase in marijuana use, particularly among young people. [1]

There is significant variation in legislative approaches globally. The only countries where recreational marijuana use is completely legal are North Korea and Uruguay. [17] However, there are several countries where marijuana has been decriminalized or where the law is formally unenforced (see map below). There are also many countries that allow the use of marijuana for medicinal purposes, including Austria, Canada, Finland, Germany, Israel, Portugal and Spain (not indicated in the map). [18]



Source: Wikipedia "World-cannabis-laws"

[http://upload.wikimedia.org/wikipedia/commons/e/ed/Cannabis\\_law\\_worldwide.png](http://upload.wikimedia.org/wikipedia/commons/e/ed/Cannabis_law_worldwide.png)

One of the most commonly referenced cases of alternative legislation is the Netherlands, where the law specifies strict guidelines on the permitted quantities of "soft drugs" and the way they are used, bought and sold. [19] Laws governing driving under the influence of alcohol also apply to driving under the influence of these soft drugs. [19] Similar to other countries, it is illegal to grow, process and trade marijuana on a large scale, although violators face less severe consequences in the Netherlands. [19]

Portugal's laws demonstrate another means of decriminalizing cannabis. Since 2001, it has been permitted for individuals to have up to an "average of a 10 day supply" of marijuana (or any other illicit drug, for that matter) in their possession for personal use only. [18] Possession of between a three- and 10-day supply may result in referral to an administrative panel, which can recommend monetary sanctions or treatment programs. [18] It should be noted, however,



that the possession of more than a 10-day supply, and the cultivation and trafficking of illicit drugs are not permitted under current legislation. [18]

Mexico has also decriminalized cannabis (among other illicit drugs). Definitions for the maximum quantities of various drugs that could be considered reasonable for personal consumption were laid out in a 2009 statement from the federal government. [18] Referrals for treatment and other non-criminal procedures were also enumerated for people in possession of illegal drugs in the permitted quantities. [18] Similar to Portugal, it is still illegal to be in possession of large quantities of illegal drugs. [18]

## Medical Marijuana Use

Cannabis has been linked to pain relief for several centuries, with recent renewed interest in its analgesic properties. Numerous studies report some benefit on pain perception, and others report much greater pain relief. Among the beneficial side effects of marijuana use was improved ability to sleep when cannabis was used to treat pain. No overdose deaths were reported in these studies. In comparison, more recent treatment protocols for chronic pain usually include the use of opioids with a demonstrated potential for addiction and overdose, even death. Therefore, medical marijuana may present a safer alternative to these FDA-approved treatments.

Currently, The FDA did grant orphan drug designation, a special status for drugs designed to treat extremely rare diseases, to allow Epidiolex, a non-psychoactive compound containing no THC, for epilepsy treatment, specifically for Dravet syndrome and Lennox-Gastaut syndrome, both rare forms of childhood epilepsy. Epidiolex has more than 98% cannabidiol (CBD), which reportedly has medical effects with none of the psychoactive effects of THC. It is prescribed in liquid form.

**The FDA has not approved medical marijuana treatment for any medical conditions.**

The FDA has also approved Marinol and Cesamet, which are both marijuana-based medicines that can be prescribed to cancer patients for nausea caused by chemotherapy and to AIDS patients to stimulate appetite. These do contain THC and are sold in pill form. Sativex is a mouth spray approved in the U.K. and Canada and currently in Phase 3 clinical trials in the U.S. This is approved for relief of cancer-associated pain, spasticity and neuropathy pain. It was granted "Fast Track" designation in the U.S. in April 2014 for pain treatment in patients with advanced cancer and is also expected to be in Phase 3 trials in the U.S. for treating spasticity resulting from multiple sclerosis.

While the FDA approval is limited to the drugs mentioned above, in states that allow the use of medical marijuana the list of potential medical conditions approved is quite lengthy. For example, in California, approved medical conditions include: anxiety, arthritis, cancer, chemotherapy side

effects, chronic pain, fibromyalgia, glaucoma, HIV-AIDS, migraines, multiple sclerosis, radiation side effects, and a secondary list that includes more than 100 medical diagnoses that can qualify for medical marijuana use. [20] More recently there has been strong lobbying to approve medical marijuana use in patients with a history of post-traumatic stress disorder. When prescribed in most of these situations, the marijuana is either smoked or in an edible form.

## Health Impact of Marijuana Use

There are few randomized, controlled clinical trials of smoked marijuana for all possible uses, and those that have been performed involve relatively small numbers of people. Study results available fall short of what is typically required for a drug to be marketed in the U.S. At this time there are no studies that clearly document increased mortality from the use of the drug itself. There are no known acute lethal overdoses involving marijuana use.

Some limited studies are available on the impact of marijuana use on health. In its April 2014 issue, the Journal of the American Health Association referenced a French study that noted that younger people who have risks for cardiovascular disease, whether their own risk factors or family history, need to understand that using marijuana might be an unsafe choice for them and can lead to cardiovascular events and possibly death. [3]

A 2014 study conducted by Beth Israel Deaconess Medical Center and Harvard Medical School concluded that marijuana increases the risk of having a heart attack within the first hour of smoking to five times that of non-smokers. The study also pointed out that the risk could be even higher because the survey did not include people who had fatal heart attacks after smoking. It is also important to note that the five-fold risk was an average and is likely less for younger ages and much greater for older ages. As baby boomers enter the age at which coronary disease is the most common cause of death and morbidity, we may see an increase in marijuana-associated heart attacks. [4]

Marijuana seems to produce a calming effect for some users; for others, especially only occasional users, more symptoms of anxiety, depression, tremors and breathing irregularities are reported. It is unclear if the effect is from the THC itself or other substances within the inhaled smoke, such as carbon monoxide and burnt particles, that have negative effects on the heart. Previous studies have shown marijuana causes increased heart rate, fluctuations in blood pressure, and a decreased ability for the blood to carry oxygen. The heart is both working harder and getting less oxygen, a situation that increases heart attack risk.

A June 2014 article in the New England Journal of Medicine (NEJM) presented research supporting the existence of significant short- and long-term consequences of marijuana use. In the short term, marijuana users may experience impaired short-term memory, impaired motor coordination that interferes with driving skills and increases the risk of injuries, and altered judgment that increases the risk of engaging in sexual behaviors that facilitate transmission of STDs. Additionally, high doses induced paranoia and psychosis. Longer-term consequences include addiction, altered brain development, poor educational outcomes, cognitive impairment, diminished life satisfaction and achievement, chronic respiratory symptoms, and increased risk of psychosis and schizophrenia in persons with predisposition to such disorders. [21]

Increased airway resistance, inflammation of the large airways and lung hyperinflation can also occur as a result of smoking marijuana. Chronic cough and bronchitis were associated symptoms, as in regular tobacco users, but there are no studies thus far correlating marijuana use to an increased lung cancer risk, as is associated with regular tobacco use. [21]

In the NEJM study, level of confidence in the evidence for adverse effects of marijuana on health and well-being was listed as high in addiction, diminished lifetime achievement, motor vehicle accidents and symptoms of chronic bronchitis. Confidence level was medium for the findings of abnormal brain development, progression to use of other drugs, schizophrenia, depression or anxiety, and confidence level was low for lung cancer risk. [21]

Underwriting Perspective

There are potentially significant variations in the underwriting approach to assessing the smoking status assigned to marijuana users; with increased usage rates, some in the industry are pushing to place these risks at nonsmoker rates. While the associated cancer risk of regular tobacco use is not present, there is risk of chronic respiratory symptomology, including daily coughing and increased phlegm production. Consequently, infrequent or occasional use may warrant consideration of nonsmoker rates, while heavier or daily users may warrant smoker rates. These same factors would also need to be evaluated for any preferred considerations.

While life coverage may not be ratable for associated use factors, additional consideration would have to be given in other higher risk medical/nonmedical situations for waiver of premium (WP) or accelerated death (ADB) benefits, particularly if the life risk itself is ratable. In other markets, chronic illness, total permanent disability and hospitalization underwriting typically follows life ratings closely, and that would appear to apply in these scenarios overall as well. For disability coverage, the risk may be more difficult to assess.

Mortality risks from substance abuse in general arise from several factors, including the direct effects of the drugs themselves, adverse side effects associated with the route of administration, high-risk behaviors affecting judgment and some acute withdrawal complications. Recognized withdrawal symptoms with marijuana use include irritability, sleeping difficulties, dysphoria, craving and anxiety, making cessation difficult and relapse more likely.

Key Sources of Information	
Application and nonmedical/exam	APS records
Inspection report or tele-interviews	Current labs, including drug screens
MVR	Substance use questionnaires (if not developed as part of the application)

It would be prudent to consider the following in underwriting:

- Purpose of use. Is it recreational or medical, are there underlying conditions, and does the insured reside in a state with access to legally prescribed medical marijuana?
- Frequency of use and type used. There are no standard industry definitions on frequency, but for an occasional versus heavy user an industry average might indicate usage of four or more times weekly to be considered a heavy user.
- History of using other substances (alcohol and other drugs).
- Age of proposed insured. Impulsive or reckless behavior, evidence of financial or social instability, and ongoing support networks or lack thereof would be of particular concern at younger ages.
- Accidents. In addition to the motor vehicle risk noted, there is a similar potential increased risk associated with other avocations and aviation activities.
- History of mental illness.
- Risk-taking behaviors demonstrated.
- Admission of use. Though some applicants may be hesitant, honesty with admitted use would reflect a willingness to be candid about medical history.

Marijuana-related businesses come with their own set of risks. The U.S. Justice Department has informed banks that they may legally provide services to state-licensed businesses; however, banks remain reluctant to support the finances of marijuana-related businesses. Thus, the amount of business transacted in cash poses an increased security risk. There are also potential security risks associated with the growing, storage, and transportation of crops and products. These factors will provide potential challenges in the financial underwriting of risks involving marijuana-related occupations. For example, what documentation will be available for financial underwriting in business situations?

As policy shifts toward legalization of marijuana, it is reasonable to assume that usage will become even more widespread across ages, socioeconomic status and occupations and thus have a broader impact on the insurance population. Increased usage will by extension increase the number of persons for whom there will be negative health consequences.





## Conclusions

Broadly, illicit drug use is increasing globally, and marijuana is the most commonly used illegal drug. Marijuana is used in a variety of forms that contain the psychoactive chemical THC and affect brain functioning, in particular areas controlling pleasure, thinking, memory, the ability to focus, sensory and time perception, and coordinated movement. [6] Although smoking remains the most common method of marijuana consumption, edible forms are gaining traction in markets where recreational use has been legalized. The length of time it takes for edible cannabis to have an effect on the brain may present an increased risk of unintentional overdose due to the greater difficulty of self-regulation. [8]

Cannabis legislation is actively changing in many parts of the world, particularly in the U.S., with many states choosing to legalize marijuana to varying degrees in spite of a federal law that still defines the possession of marijuana as a criminal offense. Internationally, legislative approaches vary greatly, from complete legality (North Korea and Uruguay) to decriminalization (e.g., Portugal and Mexico) to alternative approaches (Netherlands) to medicinal uses (e.g., Austria, Canada, Finland, Germany, Israel, Portugal and Spain). Relaxed regulation presents unique challenges to insurers, especially underwriters, in appropriately assessing these risks.

Underwriters will want to consider the frequency, purpose and admission of use, as well as the type used and the applicant's age, history of accidents, risky behavior and other substance abuse. It will be important to use information from the application and nonmedical/exam as well as supporting documentation to be able to assess the risk accurately. The continuing evolution of both the societal views and legislation of cannabis use is interesting to witness; this new risk factor will no doubt present unique challenges and interesting opportunities for the insurance industry.

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