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HEALTH
GUIDES

Marijuana

Your Questions Answered

Aharon W. Zorea

Marijuana

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Q&A Health Guides

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To my parents, Moshe and Rivka.
Thank you.

Contents

Series Foreword

All of us have questions about our health. Is this normal? Should I be doing something differently? Whom should I talk to about my concerns? And our modern world is full of answers. Thanks to the Internet, there's a wealth of information at our fingertips, from forums where people can share their personal experiences to Wikipedia articles to the full text of medical studies. But finding the right information can be an intimidating and difficult task—some sources are written at too high a level, others have been oversimplified, while still others are heavily biased or simply inaccurate.

Q&A Health Guides address the needs of readers who want accurate, concise answers to their health questions, authored by reputable and objective experts, and written in clear and easy-to-understand language. This series focuses on the topics that matter most to young adult readers, including various aspects of physical and emotional well-being as well as other components of a healthy lifestyle. These guides will also serve as a valuable tool for parents, school counselors, and others who may need to answer teens' health questions.

All books in the series follow the same format to make finding information quick and easy. Each volume begins with an essay on health literacy and why it is so important when it comes to gathering and evaluating health information. Next, the top five myths and misconceptions that surround the topic are dispelled. The heart of each guide is a collection

of questions and answers, organized thematically. A selection of five case studies provides real-world examples to illuminate key concepts. Rounding out each volume are a directory of resources, glossary, and index.

It is our hope that the books in this series will not only provide valuable information but will also help guide readers toward a lifetime of healthy decision making.

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This book was written in the midst of the global pandemic, which means that most of my communications with friends and colleagues were conducted over email or phone. There are many people to thank, many of whom I have never had a chance to see face-to-face. My first thanks should go to my editor Maxine Taylor, who brought this opportunity to my attention. I have been thinking about this subject for many years, and the timing was perfect. I would also like to recognize the hard work of our University of Wisconsin–Platteville librarians Le Suong Cina and Sara Winger who managed to procure and convey nearly 700 books from around the state to be housed in my little home office even though many of the university facilities had been closed to the public. I would also like to thank my friends Dr. Michael Kloess from Our Lady of Hope Clinic in Madison and Bruce Roesler and Dr. Andrew Wright from the Richland Hospital Paul Corcoran from Richland Family Prescription Center, as well as my campus colleagues Eric Brewer, Stephanie Kernik, Faye Peng, and Dorothy Thompson for their insights and suggestions every time we spoke on the subject. Similarly, Ron Fruit and Phil Nee from WRCO Radio and the Weigel family (Chuck, Madeleine, Emma, Stephen, and Virginia) and my numerous family members in Alaska, Iowa, Minnesota, Wisconsin, California, and Colorado who patiently let me talk through many of the questions that are found in this volume and appropriately played devil's advocate as needed. Above all, I would like to thank my

family at home who are always supportive every time I write a book. My sons, Jacob and Jonah, and especially my lovely wife, Emily, each make a home environment both warm and productive. The pandemic may have forced us all to work from home, but they transformed our house into a warm and comforting retreat.

Introduction

About 15 years ago a student came to my office to gauge my opinion on marijuana legalization. This was long before the subject was popular, and marijuana was only legal for medical use in a few states. He was responding to a flyer that I had posted outside my office that relayed some basic facts and statistics about the dangers of marijuana, alcohol abuse, and addiction. At that time, our campus experienced a surge of students who were failing their classes due to substance abuse problems, and I was trying to provide helpful information. I recall having to replace the flyer numerous times.

This student opened the conversation by talking about drinking and how many of his relatives (uncles and cousins) had serious problems with alcohol. After a few anecdotes, he gradually turned the conversation to marijuana and his general opinion that it was a safer habit than drinking. That semester especially, when so many of my promising students were being sidetracked and were failing due to their substance abuse issues, I was curious and asked him to tell me more. His tone became more excited as he explained that marijuana was very poorly understood and that it promoted imagination, mental acuity, and was safer than both alcohol and tobacco. He simply could not understand why anyone would be opposed to it. When I asked him how he formed these conclusions, he told me that he had been reading "a lot of information online" and that he was discovering so many facts that he had never known before. He added, "[N]o one

has ever died from marijuana, but people die all the time from alcohol." My student was convinced that his conclusions were self-evident and that people were simply ignorant and prejudiced against the drug. He pointed to my flyer and said that there were "a lot of myths about marijuana."

My student was right in one respect—there are a lot of myths and misconceptions about marijuana. All of them can be easily found online written by people who share their experiences and who are personally invested in their drug use. These blog posts rarely talk about the impact their addictions have had on their relationships and school and job performance. Like many others, my student's perceptions on alcohol, marijuana, and addiction were heavily influenced by popular media, which stresses the excitement of *experience* and avoids the more problematic reality of *consequences*.

The birth of social media in the first decade of the 2000s ushered in a major shift in public opinion on marijuana specifically and on recreational drug use in general. Thirty years ago, public service announcements ran on most youth-themed programs with the message "Just say no" to drugs and alcohol, and now in the 2020s, the more common message is "Just do it." A simple internet search for "Where to buy marijuana?" can turn up more than 2.1 billion results, whereas a simple search for "Is marijuana bad for you?" results in 1/20th as many hits. The information online is certainly not balanced, and there are far more blogs and private sites marketing and promoting marijuana than there are those that stress the dangers of the drug.

Social media and the internet are only partially responsible for the noticeable shift in opinion on drug use, but the rapid increase in technological dependency has also contributed to our cultural habits. Addictions of all kinds have become more common at all levels of society, and health care professionals are becoming increasingly aware of just how widespread the problem extends—not only for teens and young adults but also for parents and grandparents. Alcohol, gambling, and drug use were obvious sources of addiction in the past, but today modern addictions include pornography, video games, social media, online shopping, and even obsessively consuming news media. Recently, we have become so reliant on digital technology that it can determine our daily routines, exaggerate our personal insecurities, and lead to widely fluctuating emotional reactions. Digital-based addictions show clearly that addiction does not require chemical dependency to be harmful to individual well-being. As rates of depression, schizophrenia, and other forms of mental and emotional illnesses rise, including rates of suicide, the need for more balanced information about the risks of addiction also rises.

This book provides thorough answers to questions about marijuana. It includes factual details about its chemistry, its effects on human cognition and emotions, and answers common questions about what it does. What makes this book unique is that it also places strong emphasis on questions related to marijuana addiction, the sociopolitical trends that seem to encourage its use, and especially the impact of marijuana use on judgment and moral reasoning. More than 600 published academic sources were used as part of the research, and these were supplemented by an equal number of nonacademic sources found through popular media. The purpose of this book is to provide readers with more balanced information that they can use to make informed choices outside of the confusing and misleading emotions that usually accompany active drug use and psychological addiction. This book does not take a position for or against legalization but instead focuses on the likely consequences of increased marijuana use.

Guide to Health Literacy

On her 13th birthday, Samantha was diagnosed with type 2 diabetes. She consulted her mom and her aunt, both of whom also have type 2 diabetes, and decided to go with their strategy of managing diabetes by taking insulin. As a result of participating in an after-school program at her middle school that focused on health literacy, she learned that she can help manage the level of glucose in her bloodstream by counting her carbohydrate intake, following a diabetic diet, and exercising regularly. But, what exactly should she do? How does she keep track of her carbohydrate intake? What is a diabetic diet? How long should she exercise and what type of exercise should she do? Samantha is a visual learner, so she turned to her favorite source of media, YouTube, to answer these questions. She found videos from individuals around the world sharing their experiences and tips, doctors (or at least people who have "Dr." in their YouTube channel names), government agencies such as the National Institutes of Health, and even video clips from cat lovers who have cats with diabetes. With guidance from the librarian and the health and science teachers at her school, she assessed the credibility of the information in these videos and even compared their suggestions to some of the print resources that she was able to find at her school library. Now, she knows exactly how to count her carbohydrate level, how to prepare and follow a diabetic diet, and how much (and what) exercise is needed daily. She intends to share her findings with her mom and her aunt, and now she wants to create a

chart that summarizes what she has learned that she can share with her doctor.

Samantha's experience is not unique. She represents a shift in our society; an individual no longer views himself or herself as a passive recipient of medical care but as an active mediator of his or her own health. However, in this era when any individual can post his or her opinions and experiences with a particular health condition online with just a few clicks or publish a memoir, it is vital that people know how to assess the credibility of health information. Gone are the days when "publishing" health information required intense vetting. The health information landscape is highly saturated, and people have innumerable sources where they can find information about practically any health topic. The sources (whether print, online, or a person) that an individual consults for health information are crucial because the accuracy and trustworthiness of the information can potentially affect his or her overall health. The ability to find, select, assess, and use health information constitutes a type of literacy—health literacy—that everyone must possess.

THE DEFINITION AND PHASES OF HEALTH LITERACY

One of the most popular definitions for health literacy comes from Ratzan and Parker (2000), who describe health literacy as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions." Recent research has extrapolated health literacy into health literacy bits, further shedding light on the multiple phases and literacy practices that are embedded within the multifaceted concept of health literacy. Although this research has focused primarily on online health information seeking, these health literacy bits are needed to successfully navigate both print and online sources. There are six phases of health information seeking: (1) Information Need Identification and Question Formulation, (2) Information Search, (3) Information Comprehension, (4) Information Assessment, (5) Information Management, and (6) Information Use.

The first phase is the *information need identification and question formulation phase*. In this phase, one needs to be able to develop and refine a range of questions to frame one's search and understand relevant health terms. In the second phase, *information search*, one has to possess appropriate searching skills, such as using proper keywords and correct spelling in search terms, especially when using search engines and databases. It is also crucial to understand how search engines work (i.e., how search

results are derived, what the order of the search results means, how to use the snippets that are provided in the search results list to select websites, and how to determine which listings are ads on a search engine results page). One also has to limit reliance on surface characteristics, such as the design of a website or a book (a website or book that appears to have a lot of information or looks aesthetically pleasant does not necessarily mean it has good information) and language used (a website or book that utilizes jargon, the keywords that one used to conduct the search, or the word "information" does not necessarily indicate it will have good information). The next phase is *information comprehension*, whereby one needs to have the ability to read, comprehend, and recall the information (including textual, numerical, and visual content) one has located from the books and/or online resources.

To assess the credibility of health information (*information assessment* phase), one needs to be able to evaluate information for accuracy, evaluate how current the information is (e.g., when a website was last updated or when a book was published), and evaluate the creators of the source—for example, examine site sponsors or type of sites (.com, .gov, .edu, or .org) or the author of a book (practicing doctor, a celebrity doctor, a patient of a specific disease, etc.) to determine the believability of the person/organization providing the information. Such credibility perceptions tend to become generalized, so they must be frequently reexamined (e.g., the belief that a specific news agency always has credible health information needs continuous vetting). One also needs to evaluate the credibility of the medium (e.g., television, Internet, radio, social media, and book) and evaluate—not just accept without questioning—others' claims regarding the validity of a site, book, or other specific source of information. At this stage, one has to "make sense of information gathered from diverse sources by identifying misconceptions, main and supporting ideas, conflicting information, point of view, and biases" (American Association of School Librarians [AASL], 2009, p. 13) and conclude which sources/information are valid and accurate by using conscious strategies rather than simply using intuitive judgments or "rules of thumb." This phase is the most challenging segment of health information seeking and serves as a determinant of success (or lack thereof) in the information-seeking process. The following section on Sources of Health Information further explains this phase.

The fifth phase is *information management*, whereby one has to organize information that has been gathered in some manner to ensure easy retrieval and use in the future. The last phase is *information use*, in which one will synthesize information found across various resources, draw

conclusions, and locate the answer to his or her original question and/or the content that fulfills the information need. This phase also often involves implementation, such as using the information to solve a health problem; make health-related decisions; identify and engage in behaviors that will help a person to avoid health risks; share the health information found with family members and friends who may benefit from it; and advocate more broadly for personal, family, or community health.

THE IMPORTANCE OF HEALTH LITERACY

The conception of health has moved from a passive view (someone is either well or ill) to one that is more active and process based (someone is working toward preventing or managing disease). Hence, the dominant focus has shifted from doctors and treatments to patients and prevention, resulting in the need to strengthen our ability and confidence (as patients and consumers of health care) to look for, assess, understand, manage, share, adapt, and use health-related information. An individual's health literacy level has been found to predict his or her health status better than age, race, educational attainment, employment status, and income level (National Network of Libraries of Medicine, 2013). Greater health literacy also enables individuals to better communicate with health care providers such as doctors, nutritionists, and therapists, as they can pose more relevant, informed, and useful questions to health care providers. Another added advantage of greater health literacy is better information-seeking skills, not only for health but also in other domains, such as completing assignments for school.

SOURCES OF HEALTH INFORMATION: THE GOOD, THE BAD, AND THE IN-BETWEEN

For generations, doctors, nurses, nutritionists, health coaches, and other health professionals have been the trusted sources of health information. Additionally, researchers have found that young adults, when they have health-related questions, typically turn to a family member who has had firsthand experience with a health condition because of their family member's close proximity and because of their past experience with, and trust in, this individual. Expertise should be a core consideration when consulting a person, website, or book for health information. The credentials and background of the person or author and conflicting interests of the author (and his or her organization) must be checked and validated to ensure

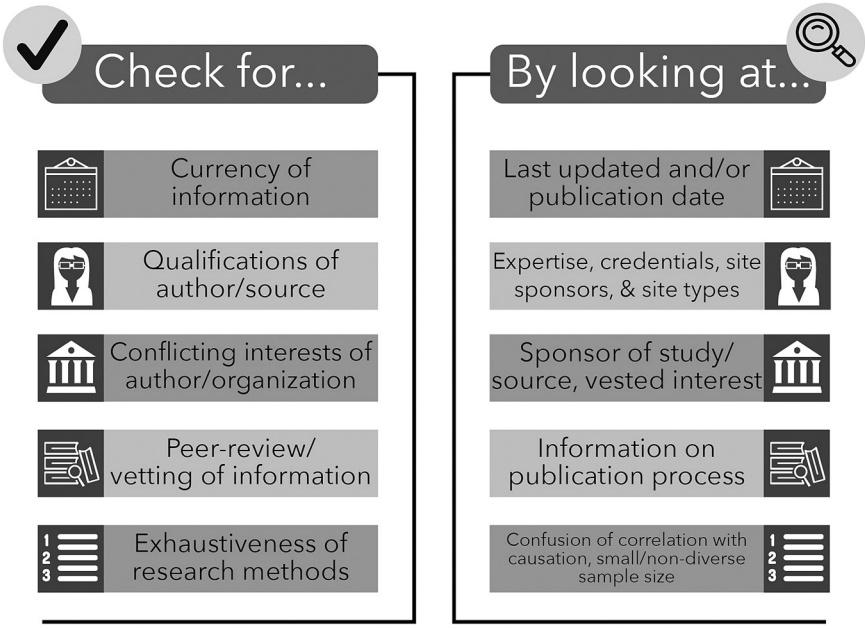
the likely credibility of the health information they are conveying. While books often have implied credibility because of the peer-review process involved, self-publishing has challenged this credibility, so qualifications of book authors should also be verified. When it comes to health information, currency of the source must also be examined. When examining health information/studies presented, pay attention to the exhaustiveness of research methods utilized to offer recommendations or conclusions. Small and nondiverse sample size is often—but not always—an indication of reduced credibility. Studies that confuse correlation with causation is another potential issue to watch for. Information seekers must also pay attention to the sponsors of the research studies. For example, if a study is sponsored by manufacturers of drug Y and the study recommends that drug Y is the best treatment to manage or cure a disease, this may indicate a lack of objectivity on the part of the researchers.

The Internet is rapidly becoming one of the main sources of health information. Online forums, news agencies, personal blogs, social media sites, pharmacy sites, and celebrity "doctors" are all offering medical and health information targeted to various types of people in regard to all types of diseases and symptoms. There are professional journalists, citizen journalists, hoaxers, and people paid to write fake health news on various sites that may appear to have a legitimate domain name and may even have authors who claim to have professional credentials, such as an MD. All these sites *may* offer useful information or information that appears to be useful and relevant; however, much of the information may be debatable and may fall into gray areas that require readers to discern credibility, reliability, and biases.

While broad recognition and acceptance of certain media, institutions, and people often serve as the most popular determining factors to assess credibility of health information among young people, keep in mind that there are legitimate Internet sites, databases, and books that publish health information and serve as sources of health information for doctors, other health sites, and members of the public. For example, MedlinePlus (https://medlineplus.gov) has trusted sources on over 975 diseases and conditions and presents the information in easy-to-understand language.

The chart here presents factors to consider when assessing credibility of health information. However, keep in mind that these factors function only as a guide and require continuous updating to keep abreast with the changes in the landscape of health information, information sources, and technologies.

The chart can serve as a guide; however, approaching a librarian about how one can go about assessing the credibility of both print



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and online health information is far more effective than using generic checklist-type tools. While librarians are not health experts, they can apply and teach patrons strategies to determine the credibility of health information.

With the prevalence of fake sites and fake resources that appear to be legitimate, it is important to use the following health information assessment tips to verify health information that one has obtained (St. Jean et al., 2015, p. 151):

- **Don't assume you are right**: Even when you feel very sure about an answer, keep in mind that the answer may not be correct, and it is important to conduct (further) searches to validate the information.
- **Don't assume you are wrong**: You may actually have correct information, even if the information you encounter does not match—that is, you may be right and the resources that you have found may contain false information.
- **Take an open approach**: Maintain a critical stance by not including your preexisting beliefs as keywords (or letting them influence your choice of keywords) in a search, as this may influence what it is possible to find out.

- **Verify, verify, and verify**: Information found, especially on the Internet, needs to be validated, no matter how the information appears on the site (i.e., regardless of the appearance of the site or the quantity of information that is included).

Health literacy comes with experience navigating health information. Professional sources of health information, such as doctors, health care providers, and health databases, are still the best, but one also has the power to search for health information and then verify it by consulting with these trusted sources and by using the health information assessment tips and guide shared previously.

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Common Misconceptions about Marijuana

1. MARIJUANA HAS BEEN USED SAFELY FOR THOUSANDS OF YEARS BY PEOPLE ALL OVER THE WORLD

It is true that the *Cannabis* plant has been cultivated for at least 5,000 years and that it has been used as a drug for almost as long. That does not mean that marijuana has been used safely as a drug for all that time, nor does it mean that it was socially acceptable for most people to use marijuana recreationally. For most of its history, *Cannabis* was known as hemp and was cultivated mostly as a source for textile (cloth). Hemp was grown all over the world, but it was not used as a drug. Most hemp farmers did not use or even know about the potential drug use of their crops. Varieties of *Cannabis* used for drug purposes were much less widely cultivated and usually limited to small groups in each society who knew about the drug and who used it for ritualistic purposes. Widespread recreational drug abuse of any kind was rare in most premodern societies. Marijuana did not become widely recognized as a drug in the United States until the early 20th century, and marijuana smoking did not become prevalent among all classes of society until the late 1970s. *For more information, see questions 2 and 33.*

2. MARIJUANA IS THE BEST AND MOST EFFECTIVE WAY FOR DEALING WITH MANY MEDICAL AILMENTS

It is true that some researchers have identified potential uses for marijuana to treat the symptoms of certain medical conditions and the Food and Drug Administration (FDA) has approved the use of cannabidiol (CBD) extracted from *Cannabis* plants and a synthetic form of tetrahydrocannabinol (THC) to treat those symptoms. That means that marijuana-derived drugs may provide some benefit in these cases, but that does not mean there are not also other more effective treatments available to treat the same conditions. Marijuana has not been approved to treat any disease directly but has only been recognized as providing temporary remedy for certain symptoms. For each of these, other treatments exist that are generally regarded by the scientific community as more effective. Marijuana has not been identified as the *most* effective treatment for *any* medical disease or condition. People who choose to take marijuana for medical purposes do so because they prefer it to other alternatives, not because it is the most effective treatment option available. *For more information, see questions 14, 15, 16, and 17.*

3. MARIJUANA IS SAFER FOR ME TO USE THAN ALCOHOL, AND VAPING IS SAFER FOR ME THAN LEGAL TOBACCO

Every drug, including alcohol, tobacco, and marijuana, is unsafe if it is abused and when it is used to excess. Any of these three drugs might be used without lasting or permanent side effects if taken infrequently. Smoking tobacco does not include any psychoactive properties and will not cause any impairment to judgment or motor functions, and of the three, it is the safest to take while performing any other task. Smoking marijuana increases the same cancer risks as tobacco, plus it also impairs judgment and motor responses. Alcohol can lead to alcohol poisoning, but users usually become unconscious before alcohol levels reach deadly concentrations. Like marijuana, alcohol intoxication also impairs judgment and motor responses, making both drugs equally dangerous when operating vehicles. The difference is that alcohol may be consumed without producing intoxication. Marijuana use produces intoxicating effects every time it is used. Marijuana is also the only drug to produce mild hallucinogenic effects, which may permanently impair judgment and

learning potential. All three drugs can be addictive. *For more information, see questions 10, 27, 28, and 30.*

4. MARIJUANA IS NOT ADDICTIVE, AND THERE IS NO EVIDENCE THAT IT WILL LEAD TO OTHER MORE DANGEROUS DRUGS (A "GATEWAY DRUG")

Limited evidence suggests that marijuana may be physically addictive for some habitual users. The risk for psychological dependency is very high because marijuana indirectly stimulates dopamine reactions, which are tied to the brain's reward system. Its effects on mood and cognition make users highly prone to psychological dependency. Users with a family history of substance abuse or mental illness and young users (teenagers) who take the drug while their brains are still developing have much higher risks of developing dependency on marijuana and other drugs later in life. Marijuana does not force users to take harder drugs like cocaine, heroin, or methamphetamines. There is, however, substantial evidence that marijuana can create a psychological dependency that lowers the users' ability to resist the temptation to take other drugs. Early use at young ages, frequent use over long periods of time, and use of the drug as a means to escape current mental health issues, all increase the risk of dependency on marijuana and other drugs. Not all marijuana users take harder drugs, but almost all users of harder drugs take marijuana. *For more information, see questions 22, 23, 24, 25, 26, and 29.*

5. LAWS PROHIBITING MARIJUANA ARE BASED ON OUTDATED CULTURAL NORMS AND DO NOT REFLECT RECENT SCIENTIFIC RESEARCH

Recreational drug use is generally discouraged by every society because it hurts the individual user, removes the user from serving as a productive member of society, and leads to increasing social costs (health care or crime control). American lawmakers began developing drug policies with the central goal of protecting the public from drug abuse since the 19th century. Drug enforcement laws culminated in 1970 in a comprehensive schedule that classified all drugs based on whether they posed a danger of abuse, whether they were currently used for medical purposes, and whether there were existing protocols for safe medical use. Marijuana abuse did not emerge as a social issue until the 1920s when it became

strongly associated with the criminal underworld. The risks and dangers of marijuana abuse have not changed, even if public opinion has. The FDA routinely evaluates potential benefits of marijuana. As of the early 2020s, scientific research has not led to any evidence that warrants change to existing classification at the federal level. *For more information, see questions 6, 18, 32, 33, 37, and 38.*

QUESTIONS AND ANSWERS

The Social Context of Marijuana Use

1. What is marijuana?

The word "marijuana" has several meanings in modern society. It commonly refers to the dried leaflike substance that people smoke in order to get high, and it also refers to the plant where the drug comes from. There are different varieties of marijuana plants; not all of them produce the same effect when smoked. Some breeds can produce a feeling of intoxication, while others have no impact at all when ingested. Some varieties are used for their fibers to produce rope or cloth, while others are used to harvest seeds and oils that may be eaten or added to nutritional supplements or used in topical ointments. People often distinguish the types of marijuana plants by the end products they produce.

Types of marijuana plants

There are two main types of the marijuana plant. One is called *Cannabis sativa*, and the other is named *Cannabis indica*; they are usually abbreviated as *C. sativa* and *C. indica*, respectively. Both kinds of plant can produce drug-like effects, but most marijuana that people smoke comes from *C. sativa*. The type of marijuana that people eat (called hashish) comes from *C. indica*. *C. sativa* originally came from China and South Asia before

making its way to Europe and the West. It is usually taller, with many leaves. *C. indica* originated in the Middle East around Afghanistan and is usually smaller and more bush-like, with more flowers. *C. indica* is a relatively new import into the West. Since the 20th century, though, both kinds have been interbred to produce mixed varieties, and all these breeds are usually referred to simply as *Cannabis*.

Cannabis plants also come in two sexes. The male plants have stamens, which produce the pollen that is carried by the wind to the female plants. Female plants include pistils, which receive the pollen and produce flowers and seeds. Both sexes look similar during the early stages of development (usually six to eight weeks). Once they mature, the plants will look different, and the male plants usually die immediately after they release their pollen. Female plants can live for many years if they are kept indoors and away from the winter frost. Both sexes include the chemicals that affect human perception (called tetrahydrocannabinol, or THC), but the female *Cannabis* plants contain the highest concentration of these chemicals. Almost all marijuana sold for medical or recreational use comes from female plants.

Most *Cannabis* plants follow the same life cycle, but human intervention has created variations that emphasize certain desired characteristics. The plants that are grown primarily for fiber are tall (up to 15 feet high) with long, woody stems. These varieties are popularly called hemp plants. They usually produce no intoxicating effects, and up until World War II, these plants were grown extensively in Europe and the United States as a source of rope and some types of cloth. After the war, plastics were invented, and hemp was no longer commercially viable. Hemp is still used in small markets to produce hats, bags, and other specialized clothing items. Artificial petroleum-based fibers (such as nylon, acrylic, and polyester) are less expensive to produce and manipulate and are usually stronger, softer, and warmer to the touch, so the hemp fiber market has largely disappeared.

Marijuana by-products

Most *Cannabis* plants are no longer grown for their fiber but are only grown for their pharmacological effects, which means they are used for various drugs—sometimes legal drugs, and sometimes illegal drugs. Different parts of the *Cannabis* plant have different effects on the human body, though most of them will produce some type of euphoria or other mind-altering feelings. Growers who are looking for particular effects will cultivate varieties that emphasize one part of the plant over another. The psychoactive (i.e., "drug" producing) part of the plant is found mostly in

the buds, flowers, and nearby stems. These are dried and usually smoked in a pipe or as a cigarette. This is what most people think of when they refer to marijuana or "weed."

Other varieties of *Cannabis* are grown mostly for their seeds, which are sometimes eaten or crushed to produce marijuana extracts. The seeds do not yet include the chemicals that alter human emotions or perceptions. Nevertheless, they are often used for nutritional supplements, or they are pressed to form hemp oils that are added to topical creams and ointments. Seeds are also sometimes sold to new growers who want to start their marijuana crops from seed, though most commercial marijuana farms prefer to use cuttings from existing plants to clone their plants so as to ensure more consistent characteristics in their crops.

The most potent part of the *Cannabis* plant is the sticky sap-like substance called resin that is found in the buds and the leaves. Resin becomes most abundant in female buds that have not yet been pollinated. Some growers specialize in unpollinated female plants called sinsemilla. These plants produce no seeds at all and are harvested mostly for their resin, which is extracted primarily for the intoxicating chemicals. These can be used in many forms, including concentrated oils that are often burned in a pipe or added to electronic cigarettes (called "dabs"). They produce quicker and more intense mind-altering effects than smoking. Resin that is compressed into small chunks is called hashish and may be eaten orally, vaporized, or smoked.

Most of the *Cannabis* plants that used to be grown for fiber are now grown for their chemical extracts called cannabidiol (abbreviated as CBD). These hemp resins do not contain the same chemicals that produce the mind-altering effects found in sinsemilla or hashish. Nevertheless, the association with those traditional marijuana effects inspired a strong commercial market for CBD-related products that are believed to provide medical relief for joint aches, anxiety, and many other physical ailments. These CBD-related supplements produce no noticeable effects to your perception or in the way you feel and are often included in topical ointments or in nutritional supplements that are sold in grocery and other convenience stores.

The marijuana symbol

It is sometimes confusing to tell the difference between marijuana products that produce intoxicating effects and those products that have no mind-altering effects. The same symbol of the marijuana plant with its seven green leaves spread out in a fan shape is frequently used to indicate many different products. It can represent the plant or any of the

plant parts or any of the products that the plants create. Usually, customers know the difference because recreational marijuana is not legal in most states. In those states where medical or recreational marijuana is legal, retailers will include the marijuana symbol to let customers know that they sell *Cannabis* as a legal drug in its many different forms, most of which will induce mind-altering effects. In those states where marijuana is illegal, the symbol is used to identify the marijuana extracts that do not have intoxicating effects.

Sometimes, retailers will use the word "hemp" to indicate that the marijuana product has no intoxicating effects (such as "hemp lotion" or "hemp-extract supplement"). In other cases, retailers will use the symbol but will also include large warnings that explain that their products do not produce any intoxicating effects. Almost all CBD products are advertised in this way. When the marijuana symbol is used by itself, on clothing or on posters or as a design element, the reference most often means the kind of marijuana that is smoked as a mind-altering drug.

2. What is the difference between marijuana that people smoke and other products that contain marijuana or marijuana extracts?

The main difference between marijuana that people smoke and other marijuana-based products is the amount of processing that the *Cannabis* plant is subjected to before being turned into a product that users buy.

Marijuana plants are used as a source of fiber for cloth and rope, as a nutritional supplement, and as an intoxicating drug. At one time, marijuana was used almost exclusively as a major source for cloth and rope in the era before the invention of polyester and synthetic substitutes. Today, man-made fibers make up nearly three-quarters of the textile market. Hemp grown for fiber was never smoked and was processed in the same way as other natural fibers. It was not used for recreational purposes.

In the 21st century, marijuana is mostly known for the drug-like effects it produces. Some of these effects are noticeable to human mental processes, meaning they are psychoactive. Any marijuana product that contains tetrahydrocannabinol (THC) will produce intoxicating effects. Marijuana products that contain only cannabidiol (CBD) do not produce any noticeable effects, but they may still produce drug-like effects inside the human body that could include some medicinal potential. The bulk of marijuana grown today is used for either THC- or CBD-based products.

If someone were to eat raw marijuana directly off the plant, then it is very unlikely that they would experience any drug-like effects. The active

chemicals in *Cannabis* plants, including THC and CBD, require heat to be released. That is why most marijuana is smoked. Combustion releases all the chemicals bound within the plant at once. Unfortunately, for the user, smoking also releases about 1,500 other chemicals, many of which are toxic and believed to be cancer causing (carcinogens).

Over the past century, both amateur users and pharmaceutical researchers developed ways to extract certain chemicals from the marijuana plant without having to burn it directly. Clinical laboratories can extract CBD from hemp plants using distillation and solvent-based filtration processes. THC is also extracted in a variety of similar ways. In the United States, smoking is still the most common way that THC is ingested, but vaping, alcohol-infused extracts, and marijuana edibles have also become more common since the advent of legalization by many states in 2008.

CBD and CBD products

Most CBD products come from the same sort of hemp plants that produce fibers, except they have been bred to produce more of the flowers that contain active chemicals and less of the fibrous material. Historically, like the hemp varieties grown for fiber, hemp plants grown for CBD contained very little THC (usually no more than 0.3%). Recently, modern cross-breeding designed to increase the active chemical content and lower the fibrous content has changed the genetic makeup of many hemp plants.

Hemp farmers experimenting with variations to increase CBD levels very often also increase THC levels. Legal hemp farms are regulated by federal and state agencies, and if the THC levels rise above a certain threshold, the farmer must then destroy the entire crop. That makes hemp farming for CBD a risky business despite its high profit potential. Nevertheless, once the hemp plants are harvested, there is very little oversight of the final CBD product. The FDA does not regulate the vast majority of CBD products because it is not recognized as providing proven remedies for any specific medical disorder. The FDA has recognized only one CBD extract as providing potential relief for symptoms associated with a rare form of childhood epilepsy. CBD chemicals have not been demonstrated to provide any consistent benefit for other conditions. CBD very likely causes chemical reactions at the cellular level, and those reactions may provide health benefits (or side effects), but neither of these have been consistently demonstrated in clinical studies.

Products that market themselves by their CBD content may refer to broad potential for general health and wellness, but they may not make any claims that the product will cure or treat any specific disease or

condition. The FDA has not approved and does not provide oversight for CBD products that are sold without a prescription. As such, buyers have no guarantee that the CBD product will work as advertised, and the seller has no obligation to ensure that the product is medically effective because they do not claim to cure any specific medical ailments. As with any supplement, the quality of the product is determined by the reputation of the seller. Without FDA oversight, there are very few guarantees for any product advertised as containing CBD. In some cases, CBD products sold by disreputable sellers may not even include CBD.

Smoking and THC

Marijuana products marketed for their THC content come from *Cannabis* plants grown especially for their buds and flowers (usually unpollinated female plants). These drugs can be divided into two groups: first are marijuana buds that are smoked directly, requiring very little preparation; and second are those products that have already been processed to produce a higher concentration of THC per volume unit. There is a third group of synthetic marijuana products that imitate the effects of THC but do not come from marijuana plants. At one time, these products were legally sold as marijuana substitutes and/or disguised under non-marijuana names (such as "K2" or "Spice"), but most of these have been prohibited for legal sale, though they continue to be sold through illegal sellers.

The method of delivering THC determines the rate of action and the intensity of the effects. Smoking produces a noticeable effect within seconds and will peak after about 10 minutes. The feeling of intoxication continues for about an hour before it fades away. Marijuana can be smoked either through cigarettes (called joints) or through a variety of types of pipes. Smoking releases the THC from the marijuana plant through immediate combustion, and the smoke vapors carry the THC into the lungs where it is ingested directly into the bloodstream. Different types of pipes can trap the smoke in order to increase the density of the THC gases, but they will all be limited in their immediate potency. Most THC extracts were created by users wanting to avoid the smoke or who want to increase the intensity or duration of the intoxicating effects.

Vaping and e-cigarettes

One method of ingesting THC without smoking is to vaporize the marijuana by heating the material without actually burning it. Vaporizers work because the boiling point of most cannabinoids is anywhere between

393 and 428 degrees Fahrenheit, which is below the point of combustion (around 451 degrees Fahrenheit). This means that if enough heat is applied, the psychoactive cannabinoids can be "vaporized" directly from their solid form into a gas form without actually burning, and the THC and cannabinoids may be delivered without smoke.

The vaporizing (or vaping) method can be used on either marijuana buds or on concentrated THC extracts, and both require special devices. The first method was developed by amateur users during the 1990s through the use of balloons to separate the heat source from the plant material and still convey the gases to the user. Portable units were developed later, which looked like small straight pipes and were marketed as electronic cigarettes (now known as vape pens or e-cigarettes). These require concentrated materials called dabs, which are heated electronically. Dabs can look like thin crystal crumbles, whipped peanut butter, a semitransparent wax, or like a thick oil. Their appearance and presentation depend on who made it and how it was manufactured. Sometimes, other flavors are added to disguise the actual ingredients. Marijuana dabs usually contain three to four times as much concentrated THC levels as unprocessed marijuana buds and, in some cases, can contain more than 98% THC.

In states where marijuana is illegal, vaping devices are marketed for nicotine delivery only. In states where marijuana is legal, these devices may be marketed also for THC dabs. Wherever they are sold, e-cigarettes are usually marketed as an alternative to smoking, but their popularity is due mostly to the fact that they can be used to vaporize many materials, including THC and other drugs.

The effects of vaping are just as quick as traditional smoking, but the intensity can be much greater because of the high THC concentration in the dabs. Concentrated dabs that are sold through illegal vendors often include other drugs that increase the speed and duration of the effects. Users can easily overdose using vaping devices, especially when non-marijuana drugs are included in the mixture, such as fentanyl. These overdoses have frequently caused death.

Medical marijuana extracts

In states where medical marijuana is legal, doctors may prescribe THC in a variety of different forms. In some cases, patients are given marijuana cards that allow them to buy from special dispensaries, so they can smoke marijuana in the manner they are most used to. In other cases, where smoke may increase the problems of the patients' condition, doctors may prescribe THC extracts in the form of sprays, drops, patches, or pills/capsules.

THC extracts that are infused in alcohol are called tinctures. These concentrates are administered with a dropper and placed under the tongue. The liquid dissolves quickly and enters the bloodstream a little more slowly than inhalation but still much more quickly than other ingestion methods because there is a large blood vessel under the tongue. Effects are felt within 15 minutes and reach their peak strength within 90 minutes. Due to the high concentration of THC, tinctures may produce more intense effects that last longer than smoking.

In some cases, THC is combined in equal parts with CBD and administered as a spray, which patients squirt under their tongue. It can also be infused onto a piece of sticky cloth called a patch and applied directly to the skin. These patches may take up to 30 minutes to take effect but can be designed to administer the drug to patients over long periods of time, often many hours or up to half a day. Doctors often use these THC concentrates in combination with other chemicals that customize the rate of release and may also moderate or extend the duration of effects depending on the therapeutic needs of the patient. These tools are also used for a variety of other pharmaceutical drugs.

Most of the THC extracts prescribed by medical professionals are created in pharmaceutical laboratories under FDA regulations, and they are prescribed as a clinical therapy. THC patches, tablets, and sprays are usually only used for recreational purposes if they have been obtained or distributed through illicit vendors. Due to their high THC concentrations, illegal use of these products can easily lead to overdosing.

Edible marijuana: Hashish, drinks, and confectionaries

Marijuana edibles can include any part of the *Cannabis* plant that has been infused or added to any beverage, baked goods (usually brownies and cookies), or candies (usually gummies or mints). In most states, CBD-infused goods may be sold legally and are subject to very few restrictions as long as the accompanying THC levels remain less than 0.3%. THC-infused goods are only legal in states that permit medical or recreational use of marijuana.

The use of CBD and THC extracts in the United States has only become common since the early 2000s, but eating marijuana has a very long history. Prior to the 1500s, almost all marijuana was eaten in the form of hashish. Hashish was first developed in parts of Central and Eastern Asia as a mixture of marijuana buds that were compressed, heated, and further processed to produce a thick, waxy compound that contained high concentrations of THC. Smoking was a late innovation that was

developed after the discovery of tobacco during the Columbian exchange (after the 1600s), so most hashish was eaten or indirectly vaporized in glass pipes. The resulting thick, waxy substance is still frequently eaten directly but may also be smoked or vaporized.

Since the 1960s, marijuana producers (which at the time were all illegal) would gather the crystal-like residue that forms in the containers used to store and process *Cannabis* plants to produce a high THC concentrate powder called kief. This powder could be added to baked goods (usually brownies, which include chocolate to disguise the harsh marijuana taste) to produce a THC-infused edible. These powders were also added to teas or other hot drinks. *Cannabis* plants must be heated to release THC compounds, so marijuana edibles are usually baked. Beginning around the early 2000s, the popularity of concentrated THC extracts led to the development of marijuana-infused candies and gummies. These edibles are often combined with CBD and other drugs to enhance or moderate the effect of THC.

After the wave of state-based legalization of medical and recreational marijuana in the 2010s, edibles have become increasingly popular. The edibles market share doubled every year between 2016 and 2020. Estimates suggest that nearly a third of marijuana is sold in the form of THC-infused edibles in solid and liquid forms.

Marijuana edibles can take up to an hour before the user begins to feel any effects, but they usually last two to four times longer than inhaling and can often reach greater intensities. Due to the time delay, users may not always realize how much THC they have consumed before the effects begin to take place. There is usually a much greater risk of overdosing because users are not always aware of how much concentrate they should add to the mix. Or, more commonly, they eat the marijuana products and feel nothing and then continue to eat more for nearly an hour before the effects are noticeable. By then, the concentration of THC in the bloodstream is often much higher than expected, leading to strong side effects.

Non-*Cannabis* THC analogs

Last, synthetic marijuana refers to products created in laboratories to simulate the chemical makeup of THC but which do not come from marijuana plants. These were legal in many states during the early 2000s because they were marketed as aromatic incense or as nutritional supplements and thereby slipped under the guidelines of existing regulations. They were very popular among youth especially and were sold legally in retail stores under the brand names "Spice" or "K2." These drugs did not contain any THC and did not involve any *Cannabis* plants, which were illegal in most

states at the time. Nevertheless, they contained a new chemical called HU-210, which when consumed through smoking or baked goods, produced the same effects as THC and was often more potent.

After many cases of overdoses, these products were outlawed at the federal level in 2012, and most states followed suit. These and other analog compounds (CP 47, 497, JWH-018, JWH-073, JWH-398, JWH-250, and oleamide) continue to be developed and sold through illegal markets and form a part of the same drug culture that includes marijuana, opioid, and alcohol dependency. These and other synthetic compounds carry very high risks for potential overdosing.

There are many different marijuana products that are available legally and illegally. CBD and other hemp products have no intoxicating effects, and they are usually marketed as wellness supplements. They are not regulated by the FDA unless they are combined with THC as part of a specific therapeutic treatment regimen. The popularity of CBD is mostly due to its association with THC products and their intoxicating effects, even though there is very little evidence that CBD produces medical benefits.

THC-based products all produce psychoactive effects in humans, but the form by which they are ingested determines the speed, potency, and duration of those effects. Medical marijuana can be smoked or ingested through patches, sprays, or edibles (including capsules and tablets). Recreational marijuana is most often smoked but can also be ingested as concentrated THC extracts through vaping, tinctures, or edibles. Concentrated forms of THC carry higher risks of overdosing.

The FDA only regulates medically prescribed marijuana products (only three existed as of the early 2020s). Other state agencies regulate products that are sold through legal vendors. There are very few enforceable regulations for products sold online, and there are no regulations or safeguards at all for marijuana products sold through illegal vendors.

3. What compounds are found in marijuana, and which make you feel high?

The marijuana plant contains more than 100 different cannabinoid compounds that will potentially interact with the human physiology, but only tetrahydrocannabinol (THC) produces the feeling of intoxication associated with marijuana.

Marijuana is usually smoked, so it is often associated with tobacco products. Many people think of marijuana as a "weed" as if it were made of leaves that are dried and then rolled up in a cigarette to be smoked. In fact, the leafy parts of the marijuana plant produce mostly smoke and have

very little (if any) intoxicating effect. If all other elements of the marijuana plant are removed and only the psychoactive molecules remained, then you would find a sticky, waxy substance that looks more like an oily tar than any kind of leaf. This material would contain all the cannabinoid molecules that produce drug-like effects, including THC, cannabidiol (CBD), and more than a hundred other chemical compounds that affect the human endocrine and nervous systems.

Marijuana plants contain more than 400 different chemical compounds, more than 100 of these are classified as cannabinoids, and both THC and CBD are types of cannabinoids. All cannabinoid molecules carry the same basic number of atoms, but the atoms are arranged differently for each type. It is the geometry, or shape, of the chemical molecule that determines its effect on the human body.

How drugs work

Only certain kinds of molecular shapes will fit into certain kinds of receptors in the human endocrine and nervous systems. Each molecular shape (also called an isomer) is a little like a "key" that will only fit into certain cell receptors. A receptor is a special chemical protein located on cell membranes that acts like the keyhole. If an isomer reaches the receptor and it has the wrong shape, then it will just pass on by. If an isomer reaches the receptor with the matching molecular shape, then the molecule passes through the cell membrane and triggers a series of other reactions. In this way, these molecules act like chemical messengers that tell the body to act in certain ways. These messengers may tell the body to release certain chemicals, retain other chemicals, or to turn on or turn off other bodily functions. This is how all drugs can affect the human body.

The body includes many different systems that rely on chemical messengers. Almost all hormones play a part in these systems. The brain, the internal organs, the immune system, and all the muscle groups rely on these chemical messengers to function. Drugs usually work by interrupting, or substituting, the natural messengers created by the body with artificial messengers introduced through the drug.

Cannabinoids interact with hundreds of different receptors found mostly in the nervous system (those dealing with thinking, concentration, memory, emotions, and mood) and the immune system (those dealing with your ability to fight off diseases), along with a few other systems. Though cannabinoid receptors are spread throughout many different systems in the human body, when they are studied all together, they are generally referred to as the cannabinoid system. Most chemicals found in marijuana work because they affect this system.

Different drug effects

Only some of these cannabinoid isomers, like THC, will produce the mind-altering effects that people most associate with marijuana. Other isomers, like CBD, may produce drug-like effects at the cellular level, but the person who takes them will not "feel" any different. The person taking the drug may not even know what effects those isomers are causing.

Scientists try to isolate the isomers that produce effects that people want—like euphoria, a feeling of confidence, and mild relief from physical aches and pains. At the same time, they also want to remove those other isomers that produce effects that people do not want—including increased anxiety and nervousness, confusion, disorientation, and loss of muscle coordination. In some cases, the same isomers can produce both the positive and negative effects, and scientists then try to create new compounds to customize those effects so that only the positive benefits will be felt and the side effects will be limited. These are very difficult tasks, and in most cases, scientists have been unable to be so precise. That is why almost every drug (whether marijuana based or not) has side effects for those taking the drug.

Another problem scientists face is delivering the cannabinoids to the human body safely. Most people ingest THC by inhaling the chemical when they smoke marijuana. Even if the healthy compounds of marijuana were isolated through genetic engineering, the smoker always ingests other non-cannabinoid components found in the smoke itself that are very toxic. These smoke-related elements are responsible for most of the physical harm to the heart and lungs caused by marijuana smoking. Clinical researchers have devised delivery methods that do not require smoke: capsules, tablets, or patches. The problem for the researcher is that the form of delivery will always determine the speed and intensity of the effects. In many cases, some patients feel that the capsules and tablets of THC take too long to work; therefore, they choose to continue smoking because they want the speed and intensity that only smoking provides.

Amateur experimentation

Amateur researchers also experiment with marijuana for recreational purposes. These users do not worry as much about identifying or customizing chemical isomers, but instead try to extract those elements from marijuana that produce the most satisfying "high." Recreational users focus on the effects alone and will experiment with smoking, inhaling, eating, or any other method that produces the results they are looking for. They try to minimize side effects, but they can only work on those effects that the

user can actually feel. Amateur users are unaware of many unobvious side effects, especially those that harm the internal organs or that can cause cancer or mental illness through long-term use.

Over the past 50 years, both clinical and the amateur researchers have produced hundreds of different marijuana products that can be ingested in dozens of different ways. Most marijuana is still smoked, but other concentrated forms of THC and other cannabinoids can be inhaled through special smokeless devices; ingested through capsules, patches, and topical ointments; or just eaten directly in the form of a variety of foods and candies. Some of these new products are intended to treat medical ailments and are therefore carefully studied in laboratories and regulated by the government through the FDA, which is responsible for ensuring that the public is exposed to the safest and healthiest drugs with the least number of known side effects.

At the same time, there is also a very large commercial market for marijuana products that are not regulated by the FDA, developed by amateur users who sell drugs for recreational purposes. Some of these products are legal, but in most states, most of the products are not. These products are marketed for their perceived effects only, and these unregulated products often provide few healthy effects but are also often highly toxic or dangerous to use.

4. How common is marijuana use in the United States and around the world today?

Marijuana is described as the most commonly used illegal drug in the world. The Centers for Disease Control and Prevention (CDC) estimated in 2021 that 22 million people in the United States consume marijuana each month. The World Health Organization reported in their 2019 World Drug Report that *Cannabis* was the "most commonly used psychoactive substance under international control," and they estimated 188 million people used marijuana each year.

Drug use, and marijuana use especially, has increased among all age groups worldwide since 1960, with more rapid increase in drug use since 2010. Recreational drug use is most noticeable in wealthy nations like the United States and in Europe. As a practical matter, though, it is very difficult to know for certain how many people use some marijuana on a daily, weekly, or monthly basis.

Before legalization, estimates of drug use in the United States were based on arrest reports and drug seizures, admissions into drug treatment centers, overdose and mortality rates, and surveys administered to

students and national pollsters. After states began legalizing marijuana, researchers also used sales of marijuana and THC (tetrahydrocannabinol) infused products to estimate usage. In 2014, states' treasury departments recorded $400 million in legal sales of marijuana products. Sales increased to $1 billion in 2015, $4.4 billion in 2018, and an estimated $4.7 billion in 2021. These estimates are still unreliable because they do not account for illegal sales, which occur everywhere, even in states where marijuana is legal. In addition, online sales (both legal and illegal) are rarely tracked. Legalizing marijuana makes tracking individual drug use more difficult.

The National Institute for Drug Abuse (NIDA) has conducted annual surveys of drug use among students in the 8th, 10th, and 12th grades every year since 1975. Other surveys of adults are conducted through media organizations and entertainment websites, but most internet surveys are unreliable because they focus on very narrow population sizes. NIDA surveys are more reliable, but they only track responses from teenagers currently in school. Researchers are only able to make educated guesses about the extent of marijuana use for any age group, and these estimates often reflect a very broad range of results.

How marijuana is most often consumed

National surveys indicates that marijuana is mostly smoked, though annual sales reports from legal marijuana producers indicate increasing use of vaping products, THC-infused edibles, and tinctures between 2018 and 2022. In 2019, the CDC and FDA both reported a sharp increase of nearly 3,000 injuries from THC-vaping products during a three-month period in 2019 (which included 168 deaths). The age of the victims who were admitted to the emergency room ranged from 13 to 88 and was evenly distributed between age groups (18–24, 25–34, 35 and older). This sample group suggests that vaping has become popular among all age groups. Nevertheless, other surveys report that a majority of users still consume THC through smoking because it produces a quicker sensation and is more easily available.

Age groups with the highest usage

During the late 1960s, marijuana use was most prevalent among college-age students (18–24), with marginal representation among adults aged 25–49. Students who were in college between 1965 and 1980 are part of a generational cohort known as baby boomers. As that cohort aged, their

rate of marijuana use remained generally constant as they passed through each subsequent age group. For example, younger adults (29–45) smoked marijuana during the 1980s, and older adults (49–65) continued to take marijuana during the 2000s.

As the baby boomers grew older, each later generation followed similar patterns. The highest percentage of marijuana use among high school–age students occurred in the late 1970s, when 35% of 12th-grade students admitted to monthly marijuana use. The lowest rate of marijuana use occurred in the early 1990s, when only 12% of seniors reported monthly use. Rates began to increase again in 2000 and then increased significantly after 2008. Since 2008, the number of high school seniors using marijuana appears to be increasing gradually every year, with estimates of monthly marijuana use nearing the rates from the late 1970s.

During the 1970s, almost 50% more boys used marijuana than girls. That trend changed after the spike in 2008, when usage among boys and girls became more even. Rural areas of the Midwest tend to have the lowest rates of marijuana use among students, but the available data suggest every region has consistent rates of drug use. States where marijuana is legal for either medical or recreational use usually see a significant increase of weekly drug use among all age groups. After the initial increase following legalization, later rates of marijuana use usually flatten out.

One statistical trend to note is that most people who begin smoking marijuana never quit. Prior to 1970, only a small minority of people smoked marijuana. A Gallup poll from 1969 reported that only 4% of adults had tried marijuana, and more than a third (34%) had no idea what the effects of marijuana were. As the 1970s wore on, the poll numbers changed quickly as more baby boomers reached the age of adulthood. In 1973, 12% of surveyed adults said they had tried marijuana, and in 1977, that number was 24%. By the 1980s, the number of adults who had tried marijuana ranged consistently around 50%. Best-guess estimates from 2021 indicate that the same percentage of adults who smoked marijuana consistently during the 1970s continued to do so during the 1980s, 1990s, and 2000s. A study from Columbia University in 2018 showed that the 12th graders in 1978 with the highest rates of high school–age marijuana use still had some of the highest use rates among all adults as 60-year-olds.

Trends from CDC research indicate that once people begin using marijuana, then it is less likely that they will ever stop using it. If teenage students avoid using marijuana while in high school and college, then the likelihood of remaining drug-free their entire life increases significantly.

5. How is marijuana different today than it was in the past?

Marijuana that people smoke today, in the 2020s, is about three times more potent than the marijuana that the baby boomer generation smoked during the late 1960s and early 1970s. The percentage of THC (tetrahydrocannabinol) content increased from between 3% and 10% to anywhere between 10% and 30%. In addition, modern vaping technologies that use dabs and THC extracts can reach potency levels very close to 100%. THC-infused edibles and tinctures also range in potency from mild to very strong. The overall strength of psychoactive chemicals available through marijuana after 2000 is generally much greater than what was available to users in the early 1970s.

Prior to the mid-1960s, marijuana was consumed mostly by people on the margins of society. Popular culture did not promote the drug, and most Americans were unfamiliar with it. This changed as the baby boomer generation reached college age around 1965 and began to experiment with a variety of mind-altering drugs. Marijuana use by the end of the decade was still mostly limited to younger adults, but users were spread throughout all levels of society, and the drug became more widely known in popular culture.

The main reason why THC levels changed in modern marijuana plants is because a large number of amateur farmers began experimenting independently with cross-breeding of different *Cannabis* plants during the 1970s to achieve a certain desired mixture of potency, flavor, and effect. The more common *Cannabis sativa* used in the United States was mixed with *Cannabis indica* plants that were usually reserved for making hashish. Most of these breeding experiments were conducted by amateurs working through trial and error. Since selling marijuana was illegal in every state until the 1990s, the practices were conducted in relative secret with little consistency.

After California legalized marijuana for medical purposes in 1996, commercial marijuana producers were legally permitted to grow, experiment, and test their products. Since medical marijuana was regulated by the state, the potency of each crop sample was watched closely, forcing growers to adopt careful techniques to ensure consistent yields. The rate of horticultural research increased significantly after 2000. A dozen years later, large-scale commercial farms began appearing in many states that legalized both medical and recreational marijuana use. Business enterprises invested money into increasing the potency of their products in

order to be more competitive in the marketplace. All these efforts resulted in higher concentrations of THC per plant.

As marijuana became legalized in more states, the market for nonpsychoactive CBD products began to increase in other states where marijuana was still illegal. This demand led to large-scale hemp cultivation by farmers who grew *Cannabis* plants primarily for their CBD content. The federal 2018 Farm Bill legalized hemp farming nationwide, subject to state regulations. Their crops are also highly regulated, requiring farmers to frequently test to ensure THC levels do not exceed 0.3%. These techniques were also used by other marijuana farmers to further increase THC content.

Electronic cigarettes were invented in China in 2004 but became very popular in the United States around 2010. As users became accustomed to replacing nicotine extracts with other flavors, the demand for THC dabs (and other drug combinations) grew. This led commercial marijuana farmers to increase the THC content in their plants as much as possible so that they could be used for extracts. These plants often have an unpleasant taste and are not smoked in the traditional way, but pharmaceutical companies use them for their THC content alone.

Since 2010, THC has become more widely available than ever both through traditional marijuana varieties that are smoked and through various extractions. The popularity of extracts through dabs and tinctures means that the natural potency of particular *Cannabis* plants is less relevant because pure forms of THC can be consumed using a variety of new forms. Unfortunately, that means the potential for dangerous (sometimes life-threatening) effects has increased significantly since 2000.

6. How have attitudes about marijuana use changed over time in the United States?

Attitudes about marijuana use changed considerably in the United States between 1920 and 2020. The changes are not consistent though. Public attitudes about marijuana (and drug use in general) reflect a cultural divide that is split along moral, political, and clinical lines. Though cultural divisions are complex and not easily categorized, we can identify two broad perspectives on marijuana. One perspective represents modern attitudes of popular culture that emphasize entertainment and recreation, and the other represents more traditional attitudes that emphasize concerns for drug abuse and treatment.

Popular cultural attitudes are best illustrated by Hollywood films and streaming television shows that portray marijuana as a harmless recreational activity. Fictional characters often smoke marijuana but may or may not get involved in other dangerous activities. Often, the marijuana use is portrayed as something funny. This viewpoint reflects the moral and political priorities that are shared most among those who advocate for the legalization of marijuana for any purpose and who do not view recreational drug use as a moral issue but as a matter of individual preference.

By contrast, law enforcement agencies and clinicians who routinely come in contact with the victims of substance abuse and who treat addiction tend to reflect more traditional attitudes about the dangers of marijuana. This viewpoint portrays marijuana as a gateway drug that symbolizes the edge of a growing drug-dependent subculture, and these groups often produce materials that promote public awareness about the dangers of drug use and the high risks of unintended dependency.

Politicians and policymakers are equally divided along these lines. Exceptions can be found for any large group; nevertheless, Democrat lawmakers tend to follow the trends of popular cultural attitudes and usually support legislation that legalizes marijuana use for medical and recreational purposes. They also often advocate for the reduction or removal of penalties for drug use, sales, or manufacturing. From this perspective, marijuana is distinguished from harder drugs such as cocaine, methamphetamines, and the illegal use of opioids. In the opposing camp, Republican politicians generally advocate for more rigid penalties for illicit drug use and especially for illegal sales and manufacturing. Though marijuana is recognized as a less dangerous drug, it is associated with a drug-dependent lifestyle, and lawmakers strive to limit access to reduce the rates of addiction to any drug.

Historical perspective

Marijuana is often described as one of the world's oldest drugs. It is true that marijuana has been used by many different cultures and societies around the world, and for thousands of years. That does not mean that it was used by many people. Marijuana use was never viewed as socially acceptable by the majority of people in *any* society. Even by modern standards, drug use is limited to the margins of society. Successful people are rarely associated with drug addicts, and high school counselors will never promote marijuana use as key to a promising future. Any drug that impairs normal function and is used for recreational purposes carries some level of social stigma.

In primitive societies, drug use was usually relegated to shamans—people believed to be able to communicate between the physical and spiritual worlds. For example, ancient Native Americans sometimes used hallucinogenic plants, including forms of *Cannabis*, to induce visions for themselves or others in their care. These drugs were viewed as a form of medicine and were not used for recreational purposes. The plants were usually collected in small quantities, and the knowledge of how to prepare them was not always widely known. For example, the hemp farmers who grew *Cannabis* for rope and cloth for England and the American colonies during the 1700s knew very little about its mind-altering effects. Industrial hemp contained very little THC and was not smoked in the same way as tobacco, so it was not viewed by farmers as a drug of any kind.

Drug use and manufacturing techniques changed during the mid-1800s as scientists began identifying and extracting potential chemicals from traditional plants as potential medicinal treatments. Absinthe is a combination of wormwood and other herbs that was given to French troops during the Napoleonic wars to treat malaria. Morphine was taken from opium and used during the same time period as a treatment for extreme pain. Heroin was later developed from morphine compounds in the 1870s and used to treat migraine headaches. Cocaine was extracted from coca leaves and prescribed by doctors like Sigmund Freud, as a stimulant to treat depression.

As science developed the ability to extract the psychoactive components from medicinal plants and herbs, the availability of mind- and mood-altering drugs in popular society increased significantly. By the 1880s, many ordinary soldiers who were exposed to powerful drugs while in battlefield hospitals continued their habits back home. As regular trade routes developed between the opium production centers in Asia and new consumers in Europe, the problem of drug addiction became more apparent in popular society. These habits were generally viewed as self-destructive and more dangerous than alcohol addiction. Victorian writers like Arthur Conan Doyle used drug addiction in their fictional characters to symbolize the edge of the criminal underworld. Drug use as a recreational activity existed in most places around the late 1800s, but it was never viewed as a socially acceptable habit.

In the United States, some of the first laws regulating illegal drug use appeared around 1900 after the creation of the FDA. The 1906 law mostly required pharmacists to correctly label their products to ensure that consumers were aware of the psychoactive content in commercial products. Marijuana use became more popular after the influx of immigrants following the 1910 Revolution in Mexico, but it was viewed as an ethnic

habit. Alcohol was the most commonly problematic drug at the time, and the temperance movements focused most attention on the prohibition of alcohol. After the traumatic experiences of the World War I, American lawmakers passed a national prohibition on the sale and manufacture of alcohol with the ratification of the Eighteenth Amendment in 1919.

During the Prohibition years of the 1920s, most state laws only prohibited the sale of alcohol, not its consumption. That meant that if people could find an illegal bar (called a speakeasy), then they could order alcohol with little risk to themselves. This resulted in a large transfer of money from legitimate sources (businessmen) to underworld sources (criminals). Since speakeasies were already illegal, they usually provided access to other illegal activities such as gambling; prostitution; and drugs, including marijuana, morphine, cocaine, and heroin.

In urban areas, alcohol was viewed as mostly harmless, so law enforcement often ignored the speakeasies. As the 1920s unfolded, the gambling and vice from these illegal bars reached public notice through increased crime rates from addiction, extortion, and gangland violence. By 1930, speakeasies were inseparably associated with public vice of all kinds and were symbolic of the criminal underworld.

Public pressure pushed to separate alcohol from these other vices, and the Eighteenth Amendment was repealed in 1933. At the same time, most individual states began specifically criminalizing other activities such as gambling and drug use, including marijuana use. Marijuana was criminalized at the national level in 1937. During World War II, alcohol was legal, but marijuana remained strongly associated with the criminal underworld and drug subculture. It was never viewed as the most dangerous drug, but marijuana use was seen as a gateway vice that led to other self-destructive behaviors like gambling, prostitution, and harder drug use.

Baby boomers and the new drug culture

Immediately following World War II, servicemen and women came back from the war and started families. Between the years of 1945 and 1955, the United States experienced massive growth in population, with approximately one in four people aged 10 or younger. This generation became known as the baby boomers, and by the time they reached the age of adulthood in the mid-1960s, much of popular culture was focused on gaining their trust and purchasing power. By the 1970s, most baby boomers were finishing college or entering the workforce. By the 1980s, they were having families of their own. President Clinton became the first baby boomer president in 1992, and every president that followed up until

2020 came from the same generation. Baby boomers were responsible for political changes on both the left and right and can be found on both sides of the cultural divide over marijuana in the 2020s.

Marijuana entered the mainstream awareness of popular culture beginning in 1970. A strong minority of baby boomers began to experiment with drug culture as college students during the late 1960s, but their parents and the rest of American society remained largely unaware. A 1969 poll reported that only 4% of adults had ever tried marijuana, and more than a third were unaware of its effects. Nevertheless, for the baby boomer generation, marijuana was part of a counterculture movement that was associated with the sexual revolution, rock-and-roll music, and rebellion against authority.

There was a generational reaction to the growing counterculture, and President Nixon was elected largely on his promise to restore law and order amid an outbreak of urban riots (more than 450 between 1966 and 1968). As part of his anti-crime campaign, Nixon signed the Controlled Substances Act of 1970, which classified marijuana in the same category as heroin, lysergic acid diethylamide (LSD), and methamphetamines as a Schedule I drug. These drugs are defined as having high potential for abuse and for which there were no current therapeutic uses as a medical treatment option. Nixon also supported other laws that created new enforcement agencies and task forces to combat the growing drug subculture.

Throughout the 1970s, high school–age students experimented with marijuana in large numbers. At the same time, their parents became increasingly concerned about the availability of drugs in schools and demanded more political action. When President Ronald Reagan took office in 1980, strong public pressure resulted in more laws that targeted drug dealers connected with juvenile street gangs and school zones. Reagan proclaimed a "War on Drugs," and First Lady Nancy Reagan launched the "Just Say No" campaign in public schools. These efforts proved effective, and student drug use dropped by two-thirds in the 1990s.

The antidrug culture began to fade when the Reagan/Bush era was replaced by the new Democrat administration. Baby boomer Bill Clinton was the first president to admit to using marijuana though he pretended that he "didn't inhale." Most people thought it was a joke, and later baby boom–age presidents all admitted to having smoked marijuana at some point in their youth. By 2000, baby boomer adults dominated leadership positions in business and politics, and the antidrug messages of the 1980s gradually changed. In 2020, President Biden became the first president to openly advocate for the legalization of marijuana nationwide.

Legalization movement

In 1993, Presidents Clinton's surgeon general Joycelyn Elders suggested legalization of drugs would reduce crime rates. The public did not support Elder's position, and she was forced to resign over the comments, but the movement to legalize marijuana for medical use became popular in many states. California introduced the first state law to legalize medical marijuana in 1996, and two years later, three more states (Oregon, Washington, and Alaska) also passed legalization measures. Fourteen more states followed suit between 1999 and 2012. Most of these states held Democrat majorities, but some (such as Alaska and Montana) were considered Republican strongholds. The main point that united Democrat and Republican lawmakers was the belief that marijuana might provide special relief to illnesses that were most common for an aging baby boomer population.

In most states, legalization for medical use was the first step toward full legalization for any use. Colorado and Washington legalized recreational marijuana in 2012, and four more states passed similar laws in 2016. A dozen more states did so before 2021, resulting in more than a third of Americans living in states where recreational marijuana is legal, with less than a third living in states where marijuana is illegal for all purposes. During the first two decades of 2000, marijuana use doubled among all age groups, and about 13% of Americans (one in eight) consider themselves "avid" users (daily or weekly). Attitudes toward marijuana obviously changed as more people used the drug and more states legalized it.

Cultural divide

While the majority of states have legalized marijuana in some form, it does not mean that the general public shares a consensus on marijuana. In some cases, those who support legalization argue that treatment is more cost effective than criminal prosecution—they may still disapprove of marijuana use but view it as less harmful than sending people to jail. In other cases, those who support medical marijuana believe that every therapeutic option should be available to any patient, but they may still oppose the recreational use of any drug. Cultural attitudes toward marijuana have changed, but they have not all changed in the same way.

In most states, police no longer investigate possession of marijuana because it is no longer criminal. That does not mean that marijuana is no longer associated with crime. Numerous studies conducted by the Department of Transportation after 2012 indicated that there is no difference in

crash rates between drivers impaired by alcohol and drivers impaired by marijuana. Since 1973, the rate of alcohol-impaired driving has decreased by 80%, while rates of marijuana-impaired driving have significantly increased. During the seven-year period between 2007 and 2014, marijuana-impaired driving increased 48%, and marijuana is the most common drug found at crash sites other than alcohol.

From the perspective of law enforcement, marijuana remains a dangerous drug and is associated with higher rates of property crimes and violence. A 2021 study of Oregon crime rates in the decade before and after legalization of recreational marijuana indicated increases not only in property crime rates, but also in violent crimes as compared to states where marijuana is not legal. Other studies report 40% of offenders arrested for any crime test positive for the presence of THC in their bloodstream at the time of arrest. There is no scientific evidence to indicate that marijuana causes criminal behavior, but there is a strong association between crime and drug use, and marijuana is the most commonly used drug in the United States.

Clinicians and those who treat addictions and disorders related to substance abuse also report increasing risks due to rising marijuana use. The most common problem is the increase of users who regularly consume multiple drugs at the same time (polydrug users). More than 67% of marijuana users also use other drugs. That means that most marijuana users experience the same risks associated with any drug use. Since 1990, deaths caused by opioid-based drug overdoses increased 600%, and opioids and alcohol are most common drugs taken with marijuana.

The most significant change in cultural attitudes between the 1920s reform efforts that prohibited alcohol and criminalized drugs is the emphasis on moral health. In the 2020s, drug policies are guided almost exclusively by standards that weigh the risks of drug use in terms of how these behaviors impact physical health. Lawmakers no longer consider the morality of drug abuse, and political reform movements do not emphasize the importance of protecting the moral health of the public. New drug laws tend to favor restrictions or penalties for recreational use. At the same time, however, the physical and social risks of drug abuse have not changed, so there have been significant increases in government support for social services that treat the psychological and social effects of drug abuse and addiction.

Marijuana's Effects on the Body and Mind

7. What are the general effects of THC on the biochemistry inside the human body?

THC, or tetrahydrocannabinol, works on the central nervous system with added effects on cells related to reproduction, immunity, and other internal functions. That means marijuana mostly affects user experience and triggers chemical reactions related to the sense of pleasure and satisfaction. These emotions are usually reached through the natural experiences we share through human interactions, but THC artificially triggers hormones that trick the body into producing similar feelings of pleasure without having to engage in the physical experiences.

Drug biochemistry

The central nervous system is made up of the brain, spinal cord, and nerve cells that extend out to tissues. Chemical messages pass along nerve cells (called neurons) through a series of chemical interactions. Unlike the circulatory system, there is no moving fluid in the nervous system. The spinal cord is made up of billions of neurons aligned like a train on several parallel tracks, and information is passed through chemical interactions that span the tiny space between neurons (called the synaptic gap). Tiny

molecules from one cell pass from specially shaped neurotransmitters over to another similarly shaped receptor in the next cell. At each step, numerous feedback loops tell the surrounding tissues how to respond.

The same nervous system that controls our bodily movements also controls functions of our internal organs as well as those higher functions related to mood, memory, concentration, and thinking. Each neuron has many receptors that permit multiple messages to pass along the same nerve at the same time. More than 10,000 different types of neurons trigger different functions, creating as many as one quadrillion (1,000 trillion) synaptic connections. The chemical relay system passes information from the senses into the nervous system, triggering waves of reactions to the brain, which in turn acts like a main computer and sends corresponding chemical signals back to the appropriate tissues. This process happens extremely fast, at rates of a trillion connections in a second.

Under ordinary conditions, the body supplies its own chemicals based on the types of food we eat and the types of stimulants we experience through our senses. If our finger touches something hot, the sensation passes through the skin to the nervous system, which triggers the brain to send out immediate signals prompting the muscles to pull back. The entire process may take a fraction of a second. Similarly, if we take a ride on a roller coaster, the sensations of excitement and fear triggers chemical reactions that increase our heart rates and stimulate certain pleasure circuits that make us feel differently—whether that feeling is positive or negative often depends on the person's expectations.

The drug experience

Drugs are used to artificially stimulate reactions that would otherwise be dependent on internal or external experiences. Some drugs trigger only internal functions (like heart rate or cholesterol levels), and these reactions usually occur the same way for most people. However, drugs that trigger emotional reactions are not as predictable because emotions usually depend on the users' prior experiences and expectations.

For example, if researchers figured out which neurotransmitters are triggered by the experience of a roller-coaster ride, and if they identified and copied the chemical that fits into the right neural receptors, then you might be able to take a pill and experience the thrill of a roller-coaster ride without ever leaving your room. Of course, whether that experience is positive or negative depends on the expectations of the user. For those users who just want to experience thrilling sensations, the pill would produce positive effects. There are others, though, who might feel confused

by sensations that are unconnected to an actual experience. In those cases, the pill may trigger a panic attack and cause great anxiety, producing negative effects. Still others may become so used to the sensations that they no longer produce the same "thrill." For them, they may try to increase the dose in order to capture the same emotional high. In the same way, marijuana can stimulate certain emotional reactions, but different users will often report different experiences from the same amounts of THC.

Dopamine (the "pleasure circuit")

THC fits into a set of neural transmitters and receptors belonging to the endocannabinoid system. Scientists do not know the full purpose of this system, but they do know that when it is triggered, the brain reduces levels of a chemical called gamma-aminobutyric acid (GABA), which usually happens when someone experiences fear, stress, or anxiety. GABA blocks signals that limit the stimulation of dopamine receptors, which are neurotransmitters directly related to sensations of pleasure. THC does not directly stimulate pleasure, but instead it indirectly stimulates dopamine by blocking the chemicals that usually block dopamine receptors.

Dopamine produces the sense of pleasure and satisfaction and is usually triggered by personal experiences, like an exhilarating roller-coaster ride. It is also triggered by less obvious experiences like finishing a difficult yet rewarding project or doing really well on a test. It is part of a reward system in our brain that influences what we like and what we do not like.

Different categories of recreational drugs involve different sets of receptor systems (for example, the opioid system of transmitters is entirely separate from the endocannabinoid system), yet they all eventually work by stimulating dopamine neurotransmitters. In this way, even though marijuana triggers different neurotransmitters than heroin, methamphetamines, or alcohol, they all eventually stimulate dopamine. It is the dopamine reaction that causes people to take the drugs.

Possible withdrawal signs

Drugs taken for recreational purposes release 5–10 times the normal levels of dopamine to produce the "high" that users look for. If the brain gets used to high levels of dopamine, then it develops corresponding counterbalancing systems to limit the excess pleasure sensations with new signals that trigger sickness and pain. These lead to withdrawal symptoms. If the drug directly stimulates dopamine receptors, then the withdrawal can be very harsh, including flu-like symptoms of nausea, muscle aches,

hot flashes, tremors, and hallucinations. If the drug indirectly stimulates dopamine receptors (like THC), then withdrawal symptoms are more psychologically expressed as increased irritability, anxiety, depression, and paranoia.

Endocannabinoid receptors are found throughout the central nervous system and in the liver, testicle and uterus, and muscle and fat tissues. They are not found in cells associated with the heart and lungs, which is probably why THC overdoses do not appear to directly cause death. Though THC does not appear to produce physical signs of withdrawal, the psychological effects of long-term use produce dependency symptoms similar to those found in people who are addicted to exhilarating experiences, such as gambling, pornography, and video games. Symptoms of psychological dependency result in strong emotional reactions during withdrawal that make quitting the behavior very difficult.

8. How does THC impact motor functions such as physical movement, speech patterns, and reaction times?

Marijuana affects mood, muscle coordination, balance, and both physical and cognitive reaction times. Nevertheless, the effects of tetrahydrocannabinol (THC) are not always immediately noticeable to outward observers because each person reacts differently depending on their weight, the frequency of use, and their level of experience with the drug.

Some first-time users who consume very little THC will have difficulty with their speech and balance and show noticeably slow reaction times. Other longtime marijuana users may consume four or five times as much THC and show no obvious signs of intoxication.

Impact on movement

In very general terms, while THC indirectly stimulates the dopamine neurotransmitters related to pleasure and satisfaction, it also slows down the speed by which messages travel from the brain to the muscle tissues. That means that mental processes are slowed all around, both for thinking and for movement. Since the dopamine reactions are separate from the direct THC reactions, there is not always a connection between "feeling high" and "physical impairment."

In some cases, THC effects on motor control can last much longer than the short-term effects of the dopamine. This is because, unlike alcohol, THC passes through the lungs and enters the bloodstream on its way to

tissues that are connected to the central nervous system. THC does not remain in the bloodstream very long, and some of the immediate effects from the dopamine reactions can fade away quickly depending on how the THC was consumed. Inhalation through smoking or vaping produces immediate effects, which also fade away more quickly. Vaping often uses highly concentrated dabs that produce intense effects that have more immediate impact on muscle coordination. Other THC extracts consumed through edibles may take longer to ingest, but they also last much longer in the system.

As THC is absorbed from the bloodstream into the surrounding tissues, it can be stored in fat cells. Frequent use of marijuana over an extended period of time can also cause some THC to be stored in the bone marrow. That means that THC can remain in a person's systems for days, weeks, and even months after they last used marijuana and long after the original high faded away.

Habitual use and tolerance

Users who smoke marijuana as a matter of habit can live continuously under the influence of THC, which means they develop ways of coping with the physical impairment. The central nervous system compensates with counterbalancing chemicals to ensure more consistent function of gross motor skills. Habitual users often adapt to the small amounts of THC that is continuously in their system, allowing them to speak, act, and move in ways similar to how they would react with no THC in their system at all.

Police detection

All users experience some effect on their motor skills immediately after taking marijuana. These include slower reaction times, loss of muscle coordination, increased likelihood of risk-taking, and reduced cognitive functions (especially memory and decision-making). These effects fade much more quickly for habitual users.

THC-impaired driving is illegal in every state. The problem is that state lawmakers have a difficult time defining "impairment." In some cases, high-frequency users do not show signs of impairment even if they may still feel some effects of the dopamine stimulation due to high THC levels in the bloodstream. In other cases, less experienced users may have low levels of THC yet still suffer impairment. Traditional Breathalyzer tests can only scan for blood alcohol levels, and testing for THC levels

requires specialized equipment that few officers have. Yet most scientific studies conducted since 1970s show that blood THC levels may not indicate impairment. As a result, officers are trained to focus most attention on standardized field sobriety tests that measure balance, gross motor control, and cognitive impairment. Officers look into the pupils for unequal dilation or involuntary twitching. They may ask drivers simple questions or to walk a straight line. Systematic sobriety tests are usually effective more than 90% of the time, which means that THC impairment can usually be recognized by trained observers even if blood tests are inconclusive.

9. How does THC impact cognitive functions and the limbic system?

With few exceptions, marijuana users take the drug because of how it affects their mood, perceptions, and general attitude. Emotions are difficult to measure objectively, so researchers must analyze the self-reports from marijuana users to understand their experiences. Most users report a sense of euphoria, a heightened awareness of music and color, and a general sense of confidence and well-being. For many users, these experiences feel pleasurable. That is why so many users believe marijuana helps them relax and reduce stress.

Yet marijuana is also a mild hallucinogenic that impacts users' sense of time and often influences other senses of sight, sound, touch, and smell. These senses are all perceptions from the perspective of the user, which may not always be reliable.

Role of attitude and expectations

Marijuana causes both physical and emotional reactions. Physically, tetrahydrocannabinol (THC) stimulates endocannabinoid neurotransmitters in the central nervous system, which in turn indirectly stimulates the hormones that produce sensations of pleasure and satisfaction. Chemical reactions always affect the user in similar ways at the cellular level, but these reactions impact emotions and perceptions, so actual user experiences are not always the same.

One research study tested two groups of college students taking marijuana. The first group was told their marijuana was very potent, and the other group was told theirs was very weak. In fact, both groups were given the exact same *Cannabis* at the same dosage. The group that believed they were smoking strong marijuana not only felt more impaired, but their physical reaction times were also significantly lower than the group that

thought they were smoking weak C*annabis*. There is no chemical reason to explain the influence of perception on the cognitive effects of THC, but researchers theorize that human attitudes play a large role in determining physical reactions. Since THC primarily affects human perceptions, then our preexisting attitudes and expectations always influence those effects.

The influence works both directions. Our attitudes change the outcome of taking the drug, but the THC also changes the way our senses work at a chemical level. That means that over time, frequent marijuana use will change the way users perceives its effects. Habitual marijuana users often believe the drug is producing effects that it does not produce. They also tend to *disbelieve* the side effects of dependency that outside observers can see more clearly. THC impairs the cognitive tools that are ordinarily used to evaluate its effects.

Short-term cognitive effects

THC stimulates the central nervous system by increasing blood flow to the frontal region of the brain that controls executive functions. This is the part of the brain that is responsible for attention, concentration, short-term (working) memory, impulse control, judgment, and problem-solving.

Marijuana users feel the cognitive effects of THC very quickly after taking the drug. As THC passes into the bloodstream, it is metabolized through the liver. It does not stay in the bloodstream long but is usually passed out of the body through urine, or it is absorbed into fat cells, where it slowly dissolves before eventually passing out through urine at a later time.

The effects are most intense while THC is in the bloodstream. The intensity and duration vary depending on how the marijuana was ingested. Smoking takes THC from the lungs directly into the bloodstream, producing maximum intensity of effects within 10–15 minutes and that last another 10–15 minutes just as long. Vaping intensifies these same symptoms, and they may last slightly longer depending on the dose (up to 3 or 4 hours). Tinctures and edibles that are eaten pass through the digestive tract into the bloodstream, which may take up to an hour to produce effects. Since marijuana is digested slowly, these effects may last from anywhere between 3 and 24 hours, depending on the dose.

Marijuana impairs the brain's executive functions, which results in mild visual and auditory distortion, impaired memory (especially short-term working memory), judgment, and impulse control. Users report a distorted sense of time, which is probably due to the THC limiting encoding of new memories. Learning and concentration and other mental tasks that require short-term memory (like mental math) become more difficult for the same reasons.

THC bogs down basic cognitive functions because the cannabinoid receptors are overstimulated, which explains why users take longer to make decisions while under the influence. Users also show more willingness to take risks, which is related to impulse control and judgment, which is how we distinguish between good ideas and bad ideas. At the same time, as the effects of THC wear off, users tend to feel more anxious and suspicious (described as paranoia).

The role of CBD and frequency

Intensity depends on the dose and on the ratio of THC and cannabidiol (CBD) ingested. Higher doses of THC usually produce more intense effects. CBD can limit the intensity, so most modern *Cannabis* strains are bred to produce very high THC levels and very low CBD levels. Extracts used for vaping and edibles also have very high levels of THC, with minimal (if any) CBD. Recreational users looking mostly for the "high" prefer high THC ratios, while medical users are sometimes prescribed *Cannabis* strains with lower THC ratios and high CBD amounts to limit those same effects. Some extracts used in tinctures and sprays also include higher CBD levels for medical purposes.

Intensity of effects also changes depending on how often the user takes marijuana. Ingesting THC more than once a week creates tolerance, which means that users do not experience the same intensity with the same amount of drug as when they first used. Tolerance may cause users to increase both the dose and frequency of use to experience the same level of effects, which can lead to Cannabis use disorder (a psychological dependency on marijuana). Researchers believe tolerance levels may return to normal if the user stops taking marijuana for four to six months.

Long-term effects

THC molecules that do not escape through the urine immediately are stored in fat cells, which means that the THC may influence the central nervous system long after the short-term effects are no longer noticeable. In some cases, THC may show up in urine tests anywhere between 3 and 10 days after using the drug. For heavy users, THC may be absorbed into the bone marrow, which means it can remain in the system for more than a month after the last use.

Frequent (daily) use of marijuana will influence memory because new memories are not easily encoded while under the influence of the drug. THC does not appear to damage long-term memory functions, and most

memory impairment fades away after 30 days of not using. Heavy use, though, can lead to permanent damage to short-term memory functions. Brain scans taken on chronic marijuana users suffering damages to their short-term memory sometimes show permanent changes in the frontal cortex. Sometimes the scans show no difference, and scientists do not know exactly why that happens.

Casual marijuana users may never develop any brain damage. The probability of permanent brain damage is higher for long-term users and for users with Cannabis use disorder. These permanent effects can include impaired decision-making, impulse control, and short-term memory. Researchers are uncertain as to how long it takes to permanently change brain structure, and the effects are not uniform. Some users may experience long-term damage after limited use, while others may experience few long-term effects even after heavy use. In all cases, though, users must stop taking marijuana if the long-term effects are to wear off.

Special effects on young brains

Long-term use among teens can be dangerous because the brain is still developing until age 24. Numerous studies show that THC can damage young brains—especially in areas of learning and memory functions—as well as verbal fluency and risk-taking (inhibition control). Longitudinal studies taken over 25-year time spans show significant loss of verbal memory in adulthood, which can permanently impact learning ability and IQ.

Unfortunately, marijuana use most often begins at young ages (between 16 and 24), which is precisely when marijuana is most dangerous. This may explain why users who begin smoking in high school are 18 times more likely to become dependent, and 2–3 times more likely to develop psychosis or other mental disorders later in life than nonusers. Most teens who start taking marijuana find it very difficult to permanently stop taking marijuana, even into their old age.

Less obvious dopamine effects

Marijuana indirectly stimulates dopamine reactions. Overstimulation of these pleasure circuits may lead to dependency and other psychological disorders.

Our attitudes determine the relative strength of dopamine sensations, and overstimulation can cause the body to react with countermeasures that limit the activation of these pleasure circuits naturally. That means it can be more difficult to feel the same excitement for ordinary experiences without

taking the drug. This overstimulation may occur with any drug (opioids, THC, methamphetamine, ecstasy, and others) and can significantly damage the natural reward system that we depend on for personal motivation.

Habitual marijuana users frequently experience a decline in (or complete lack of) personal motivation. The drug can act as a substitute for other natural pathways to the feeling of satisfaction, which often require more effort and are less appealing than simply taking more of the drug. Since marijuana increases personal confidence, the lack of motivation is not always recognized by the user. Habitual users often look elsewhere to explain the problems in their lives, without realizing their own role in causing those problems. This cycle leads to dependency, depression, and feelings of paranoia, which can lower the general sense of life satisfaction.

Another side effect of overstimulation of dopamine is a decrease in the body's natural ability to feel pleasure and satisfaction of any kind. This is called flat affect, and habitual marijuana users can develop symptoms where they are unable to feel and express emotions that normally affect other people. Artificial dopamine stimulation is many times stronger than natural stimulations, so normal interactions feel "flat" in comparison.

In some cases, the hallucinogenic distortion causes users to feel disconnected from the world around them—as if they are watching their actions like they were an outside observer. Researchers theorize that flat affect is due in part to chemical tolerance within the nervous system, but also partially due to permanently changed attitudes/expectations. Habitual THC use changes emotional reactions, which in the long term can dull the effect of any stimulation. The pursuit for greater stimulation is possibly why chronic marijuana users are generally more likely to use other drugs.

10. Is there a difference in the kind of "high" resulting from marijuana when compared to alcohol and other drugs?

The experience of being "drunk" from alcohol is noticeably different than the experience of being "high" on marijuana. Both alcohol and marijuana indirectly stimulate dopamine receptors, but they work in completely different ways.

Effects of alcohol

Too much alcohol slows down motor activities and sensory perceptions, so it is called a depressant. People can consume small amounts of alcohol (typically less than one serving per hour depending on the user's height,

weight, and sex) and never feel any effects because the dose is so low that it does not trigger noticeable reactions in the body. This is how people can drink wine, beer, or liquor for its flavors and never reach the point of feeling intoxicated. Like marijuana, users can develop a tolerance to alcohol, which means they can drink more alcohol without feeling or exhibiting any effects of intoxication. However, drinking more than one serving per hour usually increases blood alcohol levels that trigger biochemical reactions (above 0.05%).

If users drink more than two to three servings per hour, then blood alcohol levels can reach between 0.05% and 0.12%, and the user experiences a sense of euphoria as the alcohol begins to inhibit the chemicals that control dopamine reaction levels. At this stage, users feel "tipsy" and generally become more talkative and less inhibited. Judgment is impaired, and motor control is slightly impaired but may not always be noticeable to the user or outside observers. Users may feel more confident and more willing to engage in social interactions that they would otherwise avoid. In most states, blood alcohol levels of 0.08 is sufficient to be arrested for drunk driving.

Full intoxication occurs between 0.09% and 0.25% alcohol (around three to five servings per hour for men and two to four servings for women). When users are legally drunk, alcohol begins to slow down neural functions: motor control is impaired, and users will slur their words, easily lose their balance, and begin to feel sleepy. They become less active physically, but also less inhibited, which means they may take actions that they would otherwise not take. This is the point when some users become overly emotional—equally quick to laugh or cry and, in some cases, they may become violent.

The last stage of intoxication borders on alcohol poisoning (from 0.18% to 0.30%) and usually involves more than one serving every 8–10 minutes. Users become confused; they may have difficulty walking and may lose memory functions (called a blackout). If the user continues to drink and alcohol levels reach between 0.25% and 0.4%, they will begin to vomit or pass out. In some cases, their internal organs may shut down, and the user may have trouble breathing; body temperatures will begin to fall, and in extreme cases, the user may fall into a coma and die.

Effects of THC

Unlike alcohol, tetrahydrocannabinol (THC) is not ingested for its flavor. There is no level of sobriety where users take marijuana without feeling anything. The transition between feeling sober and feeling high happens as soon as THC levels are high enough to trigger cannabinoid receptors

(CB1 and CB2). One moment the user feels normal, and then suddenly the dopamine effects kick in, and users experience a sudden change of mood and perception (like feeling buzzed or high).

The experience of a THC high may enter different stages of intensity with repeated doses. Marijuana users have their own vocabulary for describing these stages, but since every experience is a little different, the terms are not universal (common terms include feeling buzzed, high, stoned, wasted, blazed, or tripping.) There is no easy way to distinguish one level from another except that each one is slightly more intense than the other. THC is stored in fat cells and does not remain long in the bloodstream, or in the lungs, so scientists cannot measure expected stages of THC intoxication with the same specificity that blood alcohol content is measured.

After the first dopamine effects are triggered (called the "buzz"), users feel the effects gradually become stronger with each additional dose. The increasing sense of euphoria causes users to laugh more easily, while a sense of physical relaxation spreads over the body. The limbs feel heavier, and the user becomes more immobile. Users may or may not begin to talk more, but they tend to be more introspective and may believe they are being more thoughtful and insightful. Sights and sounds might become more intense, and the sense of assurance and well-being increases so much that users may feel they are discovering new insights. This might lead to delusions of grandeur where the user believes they understand great truths. Some users may become so drawn into their own imagination that they describe a sense of being disconnected from their own sense of self. In extreme cases, this can trigger psychotic episodes among people who are vulnerable to mental illness.

At some point, THC levels reach peak concentration when the high feels most intense without leading to physical sickness. The sense of euphoria is usually accompanied by a growing sense of paranoia. Users become suspicious that other people are trying to harm them or that they are being watched and scrutinized. At the same time, user appetites increase, and they want to eat. These peak experiences are usually positive because they follow the sense of euphoria, but they can also be negative and cause intense anxiety.

If the user increases the dose beyond peak levels through concentrated THC extracts, then the user may feel physically sick with a racing heartbeat; panic attacks; an extreme sense of confusion; hallucinations; and intense paranoia, including some physical signs of dizziness, stomach pains, and vomiting. Overdose includes cannabinoid hyperemesis

syndrome and marijuana-induced psychosis. These symptoms can last up to 24 hours, but since there are no cannabinoid receptors in the cardiovascular system, THC poisoning will not lead directly to death. If THC impairment is linked with other drugs (such as alcohol and/or opioids), then the poisoning may result in death indirectly.

Summary of differences

Users who alternate between getting drunk and getting high usually report that alcohol makes them tired and depressed, while THC makes them happy and thoughtful. They also report, though, that habitual THC use causes the high to become more and more bland, while the alcohol more consistently produces the same sense of drunkenness. Marijuana makes them feel more in control, while alcohol can lead to blackouts and physical sickness.

THC mostly affects user cognition and emotional experiences. Both alcohol and THC are depressants because they inhibit certain neural functions, but THC can also distort other psychological perceptions. Marijuana can and does impact gross motor functions, but these outward signs may be less obvious in habitual users. Both THC and alcohol will impair driving even if the user is not stumbling or slurring their words. People who reach a certain blood alcohol level will noticeably lose control over their balance and coordination. Users who reach peak THC levels may or may not exhibit obvious physical signs when they walk or talk. Nevertheless, in both cases, alcohol and THC limit judgment and inhibitions, which delay reaction times and cause impaired drivers to make risky decisions that significantly increase accident rates. All states prohibit impaired driving.

The most noticeable difference between being high and being drunk is experienced after the effects wear off. Unless THC levels reach overdose concentration, the user does not usually feel physically ill when the effects begin to fade away. Instead, they feel tired and want to fall asleep. Alcohol may also induce sleep (like being passed out), but high blood alcohol levels almost always lead to uncomfortable physical symptoms as the effects wear off. These include headaches, nausea, and physical pains. This is commonly called a hangover, and it may take many hours to fade away.

Unlike THC, alcohol can become physically addicting, which means that habitual users may experience headaches, muscle tremors, fevers, and even hallucinations if they stop taking alcohol regularly. Marijuana

is highly addictive psychologically, but not physically. Cessation of THC does not appear to produce physical signs of withdrawal. In most cases, signs of THC use will fade away completely within six months of stopping.

11. How do CBD extracts affect the body?

Cannabidiol (CBD) is one of the hundreds of chemical compounds found within the *Cannabis* plant and which is linked to the endocannabinoid system of neurotransmitters in the central nervous system. In its natural form, it is almost always accompanied by tetrahydrocannabinol (THC). Scientists did not isolate and describe either the CBD or THC chemical molecules until the mid- to late 1960s, and it was only then that they realized THC caused psychoactive reactions, while CBD did not.

Later, research was conducted in the 1980s related to its potential use as an anticonvulsant to treat symptoms of epilepsy, but there was insufficient evidence to support its use as a reliable treatment. In 2013, CBD was shown to have positive effects on controlling seizures from a rare form of epilepsy known as Dravet syndrome. The following year 15 states approved the use of CBD as a medical therapy even in cases when medical marijuana was still illegal. In 2018, the FDA approved a synthesized form of CBD as a potential treatment for symptoms of Dravet syndrome, which significantly increased public awareness.

Working in conjunction with THC

Researchers are not precisely certain how CBD functions within the body. It appears mostly to inhibit certain functions of the CB1 receptor, which is usually triggered by THC and is responsible for the psychoactive effects to mood, perception, and other executive functions in the brain. Whereas THC stimulates the CB1 receptor, CBD appears to suppress some of the effects of the receptor, especially those related to psychosis and hallucinations.

For medical purposes, *Cannabis* plants that include a high ratio of CBD in relation to THC appear to soften some of the psychoactive affects. For example, if medical marijuana is prescribed to a patient to encourage their appetite, then the doctor wants to increase the functions of THC that make people feel hungry, but also limit the effects that make people feel disconnected from their emotions. Tinctures that combine CBD extracts with THC extracts can help to ease pain, increase appetite, but otherwise

limit the hallucinogenic distortion. Other cognitive functions may still be impaired, but the impact is less intense. In some cases, the THC levels can be so low (less than 0.3%) that the user may not notice the psychoactive effects at all.

For recreational purposes, CBD limits the main psychoactive effect that users are trying to achieve. Most *Cannabis* grown for recreational use has very high THC levels and very low CBD levels. If CBD is extracted completely from the *Cannabis* plant, then it has no psychoactive properties at all because it does not stimulate the CB1 or CB2 receptors in the central nervous system. Researchers are uncertain whether CBD has any meaningful effect on the human body outside of its role of softening the potency of THC.

Summary

CBD is very popular as a potential therapeutic treatment, but researchers have not been able to show that it has any other medical uses beyond as an anticonvulsant. Private companies hope to find use for it as a treatment for anxiety, a muscle relaxant for joint pains, and general pain reliever, but there is no evidence to scientifically support these claims. The FDA has approved the use of CBD as a cosmetic, but it is not approved as a dietary supplement or for any other medical therapy except as an anticonvulsant. Nevertheless, the widespread popularity of marijuana as a potential medical treatment has spilled over to CBD as an equally promising chemical. To date, there is limited research to support that expectation. CBD seems to most affect the human body when it is activated alongside other cannabinoid compounds and mostly in its ability to limit the intensity of THC. As an independent extract, CBD has not been shown to have any noticeable effects on normal healthy functions.

12. Does marijuana (THC) affect all people in the same way?

People do not experience the effects of marijuana in the same way. Tetrahydrocannabinol (THC) is a chemical that triggers the endocannabinoid system within the central nervous system in similar ways in each individual. Only minor genetic variations will alter these basic chemical processes. However, since marijuana mostly impacts cognitive functions (like mood and memory), each individual will experience these chemical reactions in unique ways.

Expectations

Assuming the marijuana or THC concentrate is given at the same dose, individuals will react differently depending on their expectations. THC produces physical changes, but individuals interpret those changes based on prior experiences. Ultimately, marijuana affects mood, cognition, and muscular coordination. Users who are expecting positive experiences through these changes will interpret them in positive ways. They may react to each new sensation as an exciting stimulation. Users who are not expecting these physical changes may not understand why they are happening, or they may feel like they have lost control over their bodily functions. These users may react negatively with heightened anxiety or even develop a sense of panic that does not go away until the experience is over. Habitual users who have become overly accustomed to these physical changes will not experience the same intensity because their sense memories of past usage limit the unique qualities of each new experience.

Endocannabinoid tolerance

Researchers cannot actually see neural activity working in the central nervous system, so they are not certain precisely how neurotransmitters and neuro-receivers change after repeated activation. The theory is that the chemical shape of each hormone (e.g., THC or GABA or endorphin) fits into the receiver like a key fits into a lock. Chemical molecules that do not have the correct shape will pass by the receivers without triggering any reactions. Molecules that have similar shapes may fit inside the receptor to trigger a reaction even if it does not have the exact same chemical makeup. That is how synthetic marijuana works (known by the street names "K2" or "Spice")—they trick the neural-receivers into reacting as if the artificial molecule was the same as the THC molecules.

Scientists theorize that after many reactions, the shape of the receiver may begin to change. Like a keyhole that gradually wears down after so many thousands of keys passing through, so too the neural receptors may wear down. When this happens, the receiver may begin to shut down some of its functions so that it does not accidentally accept other similarly shaped molecules. This is called a biochemical tolerance.

There seems to be some evidence that habitual marijuana users may develop a biochemical tolerance that results in permanent changes to the central nervous system. Researchers are uncertain whether these changes are due to psychological expectations or biochemical changes. In most cases, habitual users seem to recover their sensitivity if they stop using

THC for a long period of time. However, other research indicates that some of these biochemical changes may be permanent. Neural receptors are so tiny that scientists cannot measure these physical changes, so they must rely on theories based on complex correlations of probable effects.

Dopamine receptivity

Whether or not habitual THC use leads to biochemical tolerance, there is strong evidence that users develop psychological tolerance. Dopamine reactions are associated with pleasant experiences and a sense of satisfaction, but they do not cause these sensations directly. They tell the brain that certain sensations are pleasurable and act as a reward mechanism. People seek out these rewards in order to experience the same sense of pleasure.

Hyperstimulation of the dopamine system causes it to become less sensitive to new experiences. Either the brain will reduce the amount of dopamine reactions, or it will shut down the dopamine receptors altogether. In either case, the user will experience less of a sense of pleasure. It does not matter whether the dopamine reactions are stimulated by natural means (excitement from achieving a difficult goal) or from unnatural means (through THC or opioids); in either case, hyperstimulation will result in decreasing dopamine receptivity.

Habitual THC users may find their marijuana seems more bland than it used to be, so they will increase the dosage to achieve the same effect. Or they may combine marijuana with other drugs, like alcohol or opioids. Similarly, users who take other drugs may have already compromised their dopamine receptivity, which means marijuana will not produce the same experience.

Physical body type

Size and weight are less significant in marijuana than in alcohol. Blood alcohol levels are strongly correlated with the user's physical size and weight. A large male weighing 300 pounds will be able to drink more than a small female weighing 90 pounds. It is a matter of alcohol density in the bloodstream.

Marijuana does not have the same thresholds. Almost any amount of THC in the bloodstream will trigger the endocannabinoid system, and the user will experience its effects. The only variables are due to long-term usage. THC can be stored in fat tissues and, in some cases, within the bone marrow of habitual users. In these cases, differences in metabolism

will affect the time it takes for THC to leave the body. Metabolism is the speed at which the body breaks down and processes chemicals throughout the body.

13. Does marijuana make people more creative?

Marijuana does not bring anything new into the body. Tetrahydrocannabinol (THC) stimulates the endocannabinoid system that indirectly triggers dopamine reactions by suppressing gamma-aminobutyric acid (GABA). In the process, the neurons that are preoccupied by hyperactivity within the endocannabinoid system are less efficient in relaying other information to the brain, which results in slower reaction times and impaired cognitive functions. In plain language, marijuana slows down or otherwise disrupts the normal functions of the brain. It does not add any new functions or provide any new insights.

The reason why users sometimes feel like they are more creative when they take marijuana is because THC is a mild hallucinogenic. Perceptions (especially sight and sound) are distorted, and the brain's pleasure circuits are indirectly stimulated simultaneously. Judgment and impulse control are also impaired. This combination of effects causes the user to believe that they are thinking more deeply and experiencing truths in ways that no one else has experienced them. This effect is a delusion of grandeur, where the user firmly believes in their own exceptional genius without any corroborating evidence.

Outside observers who see the effects of marijuana on the user do not form the same conclusions. Instead, they see someone who has difficulty answering complex questions in a coherent manner; who has slower reaction times; who is easily confused, prone to inappropriate emotions; and who generally appears to be distracted by their own experiences. Genius and creativity are the last characteristics that an outside observer would think of when they see someone high on marijuana.

Researchers have a difficult time defining creativity under normal circumstances, and there is little agreement on how or why some people may be more creative than others. Some point to divergent thinking as a sign of creativity (i.e., the ability to consider multiple options to approaching a problem without focusing overmuch on the final objective). There is some research to suggest that marijuana does promote more divergent thinking. At the same time, creativity must also include convergent thinking for the problem-solving process to be complete (i.e., the ability to evaluate

and consider all available options to arrive at a single solution). The same research suggests that marijuana significantly impairs convergent thinking because it disrupts the parts of the brain that deal with judgment and evaluation. Divergent thinking that is unbalanced by convergent thinking generally impedes the creative problem-solving process. In this way, marijuana may significantly impair effective creativity.

The last obstacle to creativity is motivation. THC indirectly stimulates dopamine reactions, which provides the sense of pleasure and satisfaction that makes marijuana psychologically addictive. Hyperstimulation of the dopamine pleasure circuits usually results in a decline in motivation for other sensations. Marijuana makes users less motivated in general. Creativity relies on some action and usually involves a great amount of trial and error. As motivation decreases, so too do the processes of creativity.

Medical Marijuana

14. What were the main maladies that medical marijuana was originally intended to treat?

In 1996, through Proposition 215, California became the first state to legalize the use of marijuana for medical treatment. Between 1998 and 2012, 18 more states passed similar laws, and in 2012, Washington and Colorado became the first states to also legalize marijuana for recreational use. Since 1996, more than two-thirds of U.S. states have passed laws legalizing marijuana (*Cannabis*-based derivatives) for medical use.

In 2017, more than 20 years after California passed Proposition 215, the National Academies of Science, Engineering, and Medicine posted a report that identified 100 conclusions about medical marijuana. The report indicated there was "substantial and conclusive evidence" that marijuana could provide relief for the treatment of chronic pain in adults and from nausea and vomiting as a result of certain chemotherapy treatments and moderate spasms related to multiple sclerosis (MS) as reported by patients. There was "moderate evidence" that marijuana might improve sleep patterns for patients from obstructive sleep apnea, fibromyalgia, chronic pain, and MS. Substantial to moderate support means that numerous studies were conducted, and most of them agreed with each other.

The report also listed out conclusions for which there was only "limited evidence," meaning that many studies were conducted, but they did not always provide similar conclusions. In plain language, this means

that there is strong doubt as to whether the conclusions are true for most patients. There was limited evidence to support the claim that marijuana was effective in increasing appetite for acquired immune deficiency syndrome (AIDS) patients, for moderating spasms related to MS as actually measured by doctors, for improving symptoms of Tourette syndrome, or for improving symptoms of anxiety and post-traumatic stress disorder (PTSD). By contrast, the report also concluded that there was limited evidence to reject the claims that marijuana improves symptoms of dementia and intraocular pressure related to glaucoma and reduces depression in patients suffering from chronic pain or MS.

Finally, the report indicated that there was no (or "insufficient evidence") to support claims that marijuana could treat cancer or cancer-related anorexia, irritable bowel syndrome, spasms related to spinal cord injuries, symptoms related to Huntington's disease, schizophrenia, or that it would help in treating addictions to any substance (like alcohol or opioids). These negative conclusions were listed because there are many popular claims that marijuana can treat any of these (and other) diseases or pathologies.

In addition to possible treatment options, the risks of medical marijuana were also outlined in the academy's conclusions. There is substantial evidence that long-term marijuana use damages respiratory functions; increases incidents of chronic bronchitis; increases risk of schizophrenia and other psychoses; and impairs learning, memory, and attention span. Marijuana use also increases risks of mania, bipolar disorder, suicidal thoughts, and successful suicide attempts. There is limited evidence indicating that marijuana smoking increases chronic obstructive pulmonary disease (COPD), liver disease, and the risk of developing anxiety disorders.

In 2020, the American Heart Association issued a public statement that repeated many of the conclusions listed by the American Academy of Sciences, Engineering, and Medicine. They added, however, that most benefits from marijuana occurred when tetrahydrocannabinol (THC) was administered as a tincture, repository, or in edible or pill form. Smoking marijuana significantly increased cardiovascular disease and the risks of certain cancers. Due to the likelihood of contamination, the FDA and CDC both issued explicit warnings about the significant dangers of vaping, which is not recommended for any medical uses.

15. What do most patients actually use marijuana for?

Most popular websites that advertise the advantages of medical marijuana point to treatments for very harsh diseases, such as cancer, multiple sclerosis

(MS), acquired immune deficiency syndrome (AIDS), and post-traumatic stress disorder (PTSD). The vast majority of legal prescriptions for marijuana are given out for more mild causes, specifically for treatments associated with chronic pain and anxiety. To a lesser extent, marijuana is also prescribed to treat the mild symptoms caused by harsh diseases (such as cancer, MS, or AIDS) that may involve increased anxiety.

Chronic pain

Chronic pain is defined as any pain that lasts more than three months and is associated either with an ongoing illness or is from some initial injury. The feeling of pain is relative to each individual, and doctors cannot measure it with precision. Generally, chronic pain describes aches that make ordinary or routine actions difficult or uncomfortable at some point during the day. Chronic pain is distinguished from traumatic pains in that it does not interfere with most daily activities. These aches may not be measurable by a doctor, so the diagnosis of chronic pain mostly depends on reports by the patient.

Marijuana may provide moderate pain relief, but it is not as strong as most opioids and is not effective against serious pains related to traumatic injury. It is, however, stronger than most over-the-counter (OTC) pain relievers such as acetaminophen or nonsteroidal anti-inflammatory drugs (NSAIDs), which are in the same family as aspirin and ibuprofen. The primary difference between marijuana and opioids is that the pain relief from opioids is significantly stronger, but they are also physically addictive. The primary difference between marijuana and OTC medications is the added psychoactive elements that affect mood, which makes marijuana psychologically addictive. NSAIDs may provide similar pain relief as marijuana, but the tetrahydrocannabinol (THC) also triggers dopamine reactions that provide the added sense of euphoria, so the patient feels like they have more pain relief even if the pain is still present.

Anxiety

Anxiety is defined as a set of physical and emotional reactions to the fear of current and future events. Patients with anxiety disorders are preoccupied with worry and can show physical symptoms like hot flashes, cold sweats, racing heartbeats, dizziness, or an inability to sleep. Some of these conditions are measurable by a doctor, but most are dependent on the patient's experiences. People may experience anxiety for many reasons, most of which are not related to any underlying physical illness.

Marijuana can provide an immediate sense of euphoria, so most users describe it as immediately relaxing. The effects of marijuana are highly subjective, which means that each person reacts differently, and though some users may feel more relaxed, other users may feel more anxious because THC usually increases heart rate, and it also increases the sense of fear and paranoia as it begins to fade. After the euphoric effects of marijuana wear off, users often feel uncomfortable and begin craving for the return of that euphoric feeling. This can lead to psychological addiction. Users who become psychologically addicted to marijuana can find relief for their cravings by taking more of the drug, but they often also find their overall anxiety increased. The hallucinogenic properties of THC may convince the user that these added anxieties are due to other external causes that have nothing to do with the marijuana. This also increases the cycle of dependency.

Doctors who treat addiction rarely prescribe marijuana for anxiety disorders because they recognize that the marijuana may actually be the cause of the patient's anxiety. However, other doctors who do not specialize in addictive disorders may prescribe marijuana because it is so strongly associated with mood and perception that it seems a natural diagnosis. Users who are seeking out a marijuana prescription usually report great relief when taking it.

Other prescriptions

Marijuana does not provide enough relief to manage extensive pain, but it does affect memory, nausea, minor spasms, neural transmission, immunity, and appetite. Research does not indicate whether these effects are positive or negative, but many doctors are willing to experiment with trial prescriptions for patients who may not respond well to other existing drugs. Marijuana is sometimes prescribed to patients suffering from loss of appetite due to chemotherapy treatments or for AIDS patients. It is sometimes prescribed for patients suffering nerve pain or other nervous system diseases such as MS, fibromyalgia, Parkinson's disease, amyotrophic lateral sclerosis (ALS), and glaucoma, which affect the optic nerves.

Research does not support, nor specifically refute the potential that marijuana might potentially provide some benefit for these diseases. In many cases, though, even if specific research refutes the benefit (such as for PTSD), doctors may still prescribe marijuana based on patient preference. Every individual has a unique medical history, and some doctors are willing to prescribe marijuana on a trial basis if the individual patient believes it may help their symptoms.

"*Cannabis*-friendly" doctors

States that legalize marijuana provide some way of identifying patients with legal prescriptions. In California and Colorado, they issue marijuana cards that can be taken into any legal dispensary. Medical marijuana is usually more expensive but also more consistent in quality than recreational marijuana. In most states, marijuana is only legal for medical purposes, not for recreational purposes. For this reason, people who want marijuana for recreational use will often look for ways of obtaining a medical marijuana card.

By 2020, marijuana users spanned all demographics and all age groups. Users may be doctors, lawyers, or teachers, as well as politicians or other workers in society. That means that some doctors may advocate for the recreational use of marijuana, even in states where recreational use is still illegal. These *Cannabis*-friendly doctors are more likely to prescribe marijuana for any reasonable ailment, including headaches, stress, difficulty sleeping, and other symptoms that are difficult to measure but easy to describe. The internet and social media sites that promote marijuana often list out the names of these doctors in states where recreational marijuana is not legal. These same websites also provide instructions to users on how to describe their symptoms in a way to justify a legal prescription. In many cases, doctors will advertise themselves as "marijuana clinics" that specialize in writing prescriptions for marijuana.

Marijuana is prescribed most often for chronic pain and social anxiety because these problems are most dependent on patient self-reporting. If a patient is seeking a reason to take marijuana, then these two conditions are the easiest to describe. If the doctor is friendly to marijuana, then they use these diagnoses as safe justifications for prescribing marijuana for interested patients.

In states where recreational marijuana is legalized (like California), the number of prescriptions for medical marijuana declined significantly. In 2018, after Canada legalized *Cannabis* for both medical and recreational use, the amount of marijuana sold for medical use declined by 37%, and the amount sold for recreational use increased by 265%. Medical marijuana is often a pathway for legally accessing THC and *Cannabis* for recreational purposes.

16. What is "off-label" use?

The FDA reviews and tests drugs that are prescribed to treat illnesses. To gain approval, companies show that the benefits of the drug for a certain

ailment are greater than its potential side effects. Every prescription is approved for a specific purpose. When the drug is prescribed for purposes beyond what it was originally approved for, then it is called an off-label prescription.

As of 2021, the FDA had not approved *Cannabis* as a treatment for any disease or condition. It has, however, approved four drugs that have been derived from the *Cannabis* plant. One is a purified version of CBD (Epidiolex) that was approved in 2018 to treat seizures related to Dravet syndrome for young children over two years of age. The other three drugs are based on synthetic versions of tetrahydrocannabinol (THC). Cesamet is based on nabilone and is approved to treat symptoms of nausea for chemotherapy patients. Marinol and Syndros are based on dronabinal and have been approved to treat nausea and also to encourage appetites for acquired immune deficiency syndrome (AIDS) patients suffering from extreme weight loss. Any prescription for marijuana (or CBD) outside of these three conditions is considered an off-label prescription.

The FDA prohibits manufacturing companies from marketing their drugs for off-label use. However, as long as doctors are not working for a drug company, they may prescribe almost any drug for any use as long as there is a responsible therapeutic reason and as long as the patient fully understands and agrees with the decision. Since marijuana is often viewed as a nonlethal drug, many doctors are willing to discuss trial uses for marijuana for multiple diagnoses. In states where marijuana is only legal for medical use, most patients actively look for doctors who are willing to prescribe marijuana off label.

17. Does marijuana provide unique benefits that cannot also be provided through other prescription drugs?

Marijuana may be used to treat symptoms for many different diseases or conditions, but that does not mean it is the best treatment. A 2016 report from the Drug Enforcement Agency stated clearly that "there is no currently accepted medical use for Marijuana in the United States." Doctors have a wide choice of treatment options available to them, and they usually discuss possible benefits and likely side effects of each prescription with their patients. Even though it is legal in many states, marijuana is not the first recommended treatment for any ailment. Nevertheless, some patients may still prefer it as their first therapeutic choice because they like marijuana for other nonquantifiable reasons.

Marijuana does not provide any medical benefits that are not also available through other treatment options. However, the recreational

value of marijuana has created a strong public demand for using marijuana as a therapy. In many cases, patients might prefer marijuana even when other more effective drug options are available because they have had more experience taking the drug, or they may believe it includes fewer side effects, or they simply feel marijuana is a more pleasurable treatment option. It is a little like using a rock to pound a nail into wood; it can work, but it is never going to be as good as a hammer. In some cases, though, if the only available hammer is too big or if you have more experience using a rock instead of a hammer or if you simply like how a particular rock feels in your hand, then you may choose the rock over the hammer. In the end, the patient has the final say over which legal medication best suits their needs, and marijuana has become a popular therapeutic choice for many patients.

Encouraging appetite

Marijuana can help increase appetites for patients who have conditions that may decrease appetite such as a patient suffering from anorexia related to acquired immune deficiency syndrome (AIDS). The FDA approved a synthetic version of tetrahydrocannabinol (THC) called dronabinal to encourage appetites for AIDS patients suffering from extreme weight loss. The drug includes the same euphoric effects of marijuana and the same risks of cognitive impairment and psychological dependency. For users who have experience taking the drug, the effects are all familiar.

The FDA approved three other more traditional drug options that also increase appetite. Serostim and Somatropin are both a type of human growth hormone, and Megestrol is a steroid hormone similar to progesterone. None of these three options impair judgment, nor are they habit forming. Nevertheless, they each include other side effects and may include some negative interaction with other drugs. Marijuana is considered more of a nontraditional treatment for encouraging appetite, but it is often a popular option for AIDS patients who might also take the drug for recreational use and who might be looking for the accompanying euphoric side effects.

Nervous disorders

Any disease or condition that affects the spinal cord and nervous system or impairs the communication between one neuron and another is called a nervous disorder. Researchers have identified more than 1,200 such disorders that affect movement and touch, sight, hearing, taste, cognition and memory, and many other actions in the body. Marijuana specifically

affects the nervous system, so researchers have tried to find if there is any therapeutic value in THC for treating nervous disorders.

During the late 1970s, scientists studied THC's usefulness for treating glaucoma, which is a condition that damages the optic nerve, usually caused by high pressure in the eyeball. Since marijuana increases blood flow to the front part of the brain, where the optic nerves are located, researchers hoped THC would provide some relief. During many years of experimental trials, doctors noticed that marijuana could lower eye pressure, but the effects were temporary (just three or four hours). By the 1980s, the American Academy of Ophthalmology publicly stated they did not recommend marijuana for treating glaucoma. Instead, the FDA has approved more than a dozen different eye-drop solutions that provide more effective relief.

During the 1990s, researchers found that cannabidiol (CBD) may provide some relief for controlling spasms and seizures associated with a rare form of childhood epilepsy, and the FDA approved Epidiolex to treat very severe symptoms for very young children suffering from Dravet syndrome. For most cases, however, traditional anti-seizure medications are more effective for treating both children and adults. The FDA has approved 20 different medications, and 10 of them are approved especially for children. Research has not shown that THC or CBD has any demonstrable effect in treating seizures in adults.

Beginning in the 2000s, researchers began studying whether THC might help symptoms of multiple sclerosis (MS). MS is an immune system disorder that occurs when the body attacks the protective covering of the nerve fibers, which interferes with the communication between one neuron and the next. MS can cause paralysis and spasms. Since THC directly affects neural transmitters, researchers were hoping to use marijuana to treat spasms related to MS. The American Academy of Neurology stated that THC extracts may provide some relief for treating muscle spasms and mild pain management but also noted that other research found that there was no evidence to suggest *Cannabis* would help any other MS symptoms. The FDA has not approved any *Cannabis*-based drug to treat MS spasms, but they have approved about a dozen other unrelated drugs based on catabolic steroids that effectively help reduce inflammation, relax muscles, limit fatigue, and provide some pain relief.

Opioid alternatives

The most common use for medical marijuana is as a treatment for chronic pain. Since people feel pain differently, it is difficult to treat a diagnosis

of chronic pain with a single category of medications. The FDA has approved nearly 50 different drugs to treat a broad spectrum, from mild to severe pain. The most potent of these drugs are opium based (called opioids) that include variations such as codeine, fentanyl, hydrocodone, morphine, oxycodone, and others. Opioids are all highly addictive physically and psychologically and are the leading cause of death from drug overdoses (mostly from THC and fentanyl combinations). Some doctors prescribe marijuana as an alternative to opioids.

The least potent treatments for chronic pain are sold over the counter (OTC) without a prescription and include two different families of analgesic drugs: acetaminophen (also sold as Tylenol) and nonsteroidal anti-inflammatory drugs (NSAIDs), which are sold as ibuprofen, aspirin, Advil, and under other names. Both types provide pain relief that is similar to marijuana, though without the euphoric effect or cognitive impairment. Analgesic drugs are not habit forming and carry few side effects, which is why they are sold without a doctor's permission. NSAIDs and acetaminophen are the most recommended treatment options for chronic pain.

Research shows that opioids provide the best relief for traumatic or acute pain, especially in short-term situations, but they also have harsh side effects and a high risk for addiction. Opioids are not recommended as a treatment for chronic pain. OTC analgesics combined with healthy diet and exercise are generally recognized as the best treatment option for chronic pain, but some patients do not feel they provide a strong enough remedy. Some doctors prescribe marijuana as a middle alternative between opioids and OTC drugs because it combines mild pain relief with euphoric experiences.

A diagnosis of chronic pain is often based more on psychological disorders than on physical causes. That means that people take marijuana mostly for its euphoric effects on mood and only secondarily for pain relief.

Antidepressant alternatives

Chronic pain is often closely related to psychologically based anxiety disorders. Some patients feel uncomfortable and become fearful in certain situations, and they can confuse their emotional discomfort with physical discomfort. In some cases, doctors prescribe antidepressants or other psychologically based sedatives to treat chronic pain. In other cases, doctors may prescribe marijuana as a short-term treatment for anxiety.

Antidepressants are not addictive and do not produce euphoric effects, but they do help to balance out neurotransmitters that communicate from one neuron to the next. THC has not been shown to be an effective

treatment for depression, and in some cases, marijuana use may make the condition worse. Some antidepressants also treat symptoms of anxiety, but more common anxiety treatments include psychotherapy options that involve journaling, talking, and group therapy.

Recreational drug use usually increases anxiety and marijuana is not recommended as a treatment for anxiety disorders. Nevertheless, THC produces a euphoric effect that many users believe helps them to better relax and reduce their anxiety levels. Marijuana is a mild hallucinogenic, and it can cause users to believe the drug is more effective than it is. For this reason, users often self-medicate with marijuana to treat their symptoms of anxiety. Some *Cannabis*-friendly doctors will prescribe marijuana as an off-label treatment for anxiety and depression.

Most clinical research indicates that THC provides no long-term benefit for treating anxiety or depression. Any other FDA-approved drug would provide more effective relief.

Alternatives to diet and exercise

For almost every serious illness, doctors encourage patients to supplement their treatment options with daily exercise that includes stretching, a healthy diet, and a daily routine of meditation or prayer. These treatments are also the first recommendation for conditions related to chronic pain or anxiety, which are the two most common prescriptions for medical marijuana. These options are very effective, but they require the patient to be more active and become more accountable for their actions. For some users, marijuana might seem to provide similar levels of relief with much less individual effort. This might explain why so many users choose to self-medicate with marijuana.

Every drug includes benefits and likely risks. Diet and exercise routines are not drugs, but they provide many benefits. They also require more effort, and there is a treatment risk for patients who may not follow through with the doctor's recommendations. In most cases, patients who choose to accept a marijuana prescription believe the benefits outweigh the risks. There are always more effective treatments than THC, but users may simply prefer it to other options.

18. How long have researchers studied the usefulness of marijuana as a type of medicine?

Marijuana was listed as a Schedule I drug in the 1970 Controlled Substances Act because: 1) it had a high potential for abuse; 2) it had no

currently acceptable use as a medical treatment; and 3) it lacked accepted safety requirements to be used under medical supervision. There are five categories of drugs listed in the Controlled Substances Act, and Schedule I drugs are the most rigidly restricted. Marijuana was grouped together with heroin, lysergic acid diethylamide (LSD), methylenedioxymethamphetamine (MDMA, also known as ecstasy), and other addictive and dangerous drugs. The Drug Enforcement Agency (DEA) was also created in 1970 and charged with the mission of regulating and enforcing anti-drug laws.

Almost immediately after Congress passed the Controlled Substances Act, advocates for legal marijuana began researching ways in which it might be used for medical treatment. If marijuana could be shown to have some medical value, then it might be recategorized under a less rigidly controlled schedule such as Schedule III and IV, which include drugs with moderate to low potential for physical or psychological dependency and which provide some medical therapeutic value. Antidepressants, mild sedatives, and anabolic steroids are included in this group. Some Schedule V drugs (used mostly for cough suppression and antidiarrheal medicine) may be sold without a prescription. If marijuana were included in any of these categories, then more people would have access to it.

Most of the marijuana research conducted over the past 50 years was undertaken in order to support or overturn the Schedule I classification. During the 1970s, as marijuana use among high schoolers increased to historical highs, the DEA and federal agencies began funding research that focused on the specific dangers of marijuana use among teens. This research reached a high point during the 1980s era and President Reagan's "War on Drugs" campaign. By the 1990s, though, the President Clinton administration ended the "War on Drugs" campaign and devoted more federal support toward researching potential medical benefits of marijuana. Since 1995, most marijuana research has focused on identifying the potential therapeutic value of the drug.

Marijuana is one of the most studied drugs in the world, mostly because it is one of the most commonly abused drugs. Despite the very long history of research, the DEA reported in 2016 that there have not been "adequate" well-controlled studies that demonstrate the safety or the effectiveness of marijuana. This does not mean that there has not been enough research; it only means that the research does not indicate any reliable reason for changing the Schedule I classification. There have been tens of thousands of studies over the past 50 years, but as of 2021, the general biochemical description of marijuana remains unchallenged at the federal level.

19. How confident can patients be about the quality and potency of medical marijuana?

Most people who take marijuana for medical purposes do so without doctor supervision. The FDA has only approved one purified form of cannabidiol (CBD) called Epidiolex and three versions of a synthetic form of tetrahydrocannabinol (THC) called dronabinol. All other forms of medical marijuana are grown outside of FDA supervision and control. That means that users have very few assurances about the quality or potency of their marijuana supplies.

Each state that legalizes the sale of medical marijuana has additional regulations for *Cannabis* farmers, but there are few controls over specific marijuana products that users purchase for medical use. If a user obtains a legal prescription for medical marijuana (like a marijuana card), then they are free to choose from among hundreds of *Cannabis*-based options that may or may not be regulated or approved for any specific treatment use. In states where recreational marijuana is legal, there are no requirements that medical patients buy only from approved medical marijuana dispensaries.

In addition, users who self-medicate with marijuana may purchase their *Cannabis* products from marijuana sellers intended for recreational use. Typically, medical marijuana should have higher amounts of CBD in relation to THC, whereas marijuana grown for recreational purposes have very low CBD levels. Self-medicating users may believe that the euphoria associated with THC is more important than any other potential therapeutic benefit, and they may select high THC varieties of *Cannabis* believing that they will provide more benefit.

Last, THC concentrates used as tincture, edibles, or for vaping products (called dabs) are not regulated by any governing agency. In 2018, the FDA and CDC both issued explicit warnings that these products often contain impurities, which may include inactive substances (leafy material) or other drugs (often fentanyl) or even other poisons (rat poison was found in batches of synthetic THC, called "K2" or "Spice") resulting in numerous deaths and hundreds of hospital admissions. Users have very few assurances about the quality or consistency of any THC concentrate or synthetic THC analog.

In states where marijuana is not legal for either medical or recreational purposes, users who self-medicate must purchase their supplies from illicit dealers. Even in states where marijuana is legal in one form or another, there is always an underground market for illegal drugs. There is never any assurance about the quality or potency of drugs purchased through

illegal vendors. This is true whether the sale is made in person or indirectly through illegal vendors hosted online.

20. Does CBD provide more medical benefits than THC?

The *Cannabis* plant that marijuana comes from contains more than 560 chemical substances, of which more than 100 are cannabinoid compounds. The two most prominent compounds are tetrahydrocannabinol (THC) and cannabidiol (CBD), but all cannabinoids will trigger some part of the cannabinoid neurotransmitters in the central nervous system. That means that every compound affects the body in some way, even if those effects are not noticeable to most people.

THC alters mood, perceptions, cognition, and motor control when it stimulates the CB1 neurotransmitter. The drug quickly triggers the euphoria effects that most people look for when they take marijuana. CBD and other cannabinoids do not stimulate the CB1 transmitter, so they do not trigger the neurotransmitters that cause these outward changes. All these changes occur at the molecular level, which means they cannot be actually seen, so it is very difficult for researchers to know with certainty what the drug is doing to the living human system unless it produces some measurable effects. Since CBD does not produce obvious effects, the medical community has much less evidence to use to measure its potential effectiveness as a therapeutic tool.

To explain it very simply, scientists usually isolate the cannabinoid compound and then inject it into an animal to see what happens by measuring heart rate, immunity probabilities, life span, and so on. If they see a significant effect in animals, then they may try human test subjects. There are millions of possible changes that may be occurring with each cannabinoid, but researchers need to know what to look for and what to measure before they can know if it has any possible medical value.

THC produces obvious effects in the human body, so research into potential medical value is easier and much more extensive. CBD does not produce these effects, so research is much more limited. As of 2021, the only demonstrable medical benefit shown by CBD is in controlling seizures in very young children suffering from a rare form of epilepsy. There is also research indicating that CBD can moderate the psychoactive effects of THC, but scientists cannot explain exactly why that is. Researchers are studying the potential of CBD, but the progress is slower than studying the potential of THC.

Finally, the other limiting factor in CBD research comes from public pressure. Research into the medical potential of marijuana began in the 1970s mostly as a way of removing *Cannabis* from the list of Schedule I drugs. Most of the research was conducted with the goal of either justifying or overturning the criminalization of marijuana as a controlled substance. People take marijuana because of the euphoric effects of THC, so if the eventual goal is to legalize marijuana for recreational use, then researchers focus most attention on studying THC. CBD research began much later as a way of justifying the legalization of hemp farming during the late 1990s. Most CBD research continues to be largely motivated by the growing popularity of marijuana as a recreational drug.

21. What other potential uses of medical marijuana are researchers currently studying?

Research into the potential medical value of marijuana began in the 1970s as a reaction to its inclusion as a Schedule I drug in the Controlled Substances Act of 1970. Between the 1970s and 1990, most federally funded research focused on identifying the dangers and risks of marijuana use, especially among teens, and the social costs of addiction—learning development and impaired driving. During the mid-1990s, President Clinton's administration ended federal support for the "War on Drugs" research programs and focused more attention on the potential medical benefits of marijuana.

This shift in focus meant that researchers devote more attention trying to find any positive benefits of marijuana with the goal that a pathway might be found toward legalizing marijuana—first for medical use and then eventually for recreational use. Since 2000, most marijuana research has been guided by an effort to remove the stigma of marijuana as a dangerous drug or as source of addiction and social disorder.

Since the most obvious effects of marijuana involve elevated moods, altered perceptions, mild numbing sensations and muscular relaxation, increased appetites, and potential psychosis, most of the research since 2000 has focused on these symptoms—specifically, pain control, nausea control related to cancer chemotherapy treatments, increasing appetite related to acquired immune deficiency syndrome (AIDS) patients. New related research is focusing on irritable bowel syndrome, inflammatory bowel disease, and other digestive tract issues where marijuana may provide benefit.

The analgesic effects of marijuana lead to research into treating muscle spasms and mild pain relief for nervous disorders including multiple sclerosis (MS), glaucoma, epilepsy, fibromyalgia, Parkinson's disease, and amyotrophic lateral sclerosis (ALS). Since cannabidiol (CBD) seems to moderate the effects of tetrahydrocannabinol (THC), research is investigating the potential of CBD to protect neural processes. The effectiveness of marijuana in treating any of these conditions remains inconclusive, but research is ongoing.

New research also focuses on the potential of using marijuana as an intermediary tool to lessen the effects of opioid addiction and other psychologically based conditions. Rates of psychosis and mental illness have increased following legalization in many states, but new research focuses on identifying the potential benefits as well as the additional risks of marijuana to mental health and a wide range of anxiety disorders. Since marijuana also distorts or disrupts memory, more research is investigating its potential for treating Alzheimer's disease, dementia, and post-traumatic stress disorder.

As of 2021, very few specific medical benefits of marijuana have been demonstrated by clinical research. Nevertheless, there is strong public pressure to find some significant medical breakthrough, which might justify removing the stigma of marijuana as mostly a recreational drug and a source of personal addiction.

Risks from Marijuana Abuse and Addiction

22. Is marijuana addictive?

Marijuana is included as a Schedule I drug because of its high potential for abuse and because it is not recognized by the federal government as currently safe for medical use. Unlike most opioid drugs, marijuana does not appear to be physically addictive, but it does trigger the brain's internal reward system that often leads to psychological addiction. Not everyone who takes marijuana will become dependent, but the risk of dependency and addiction is always present. Frequency, dosage, and personal life experiences increase the probability of addiction.

What is addiction?

Addiction is a psychological condition with very real physical expressions. We may begin taking an addictive substance or engaging in addictive behaviors because they are enjoyable at first, and they cause us to naturally desire to repeat the experiences. We may discover that these substances or activities are harmful, yet when we continue taking the drugs or engaging in the behaviors even when we know they are not good for us, then we are abusing the experiences. If we develop a habit of abuse, then these habits become very hard to stop. When we try to stop, our

bodies can feel sick. These symptoms are signs of withdrawal, and they can occur for any addiction, both physical and psychological.

After a period of habitual drug use, neurotransmitters within the prefrontal cortex of our brains adapt by increasing motivation and craving and altering our memories that limit our impulse control or impair our judgment. These chemical changes can occur from drug use but may also occur from certain addictive behaviors that stimulate dopamine reactions that manage our brain's reward system. Behaviors that involve single-person choices, such as gambling, masturbation, and even the thrill of video games, or shopping can trigger these reactions. Habitual stimulation of the dopamine reward system usually leads to abuse, and eventually, we might feel compelled to continue the drug habit or the addictive behaviors even when we know they are harmful to ourselves or to others. When that happens, it is called an addiction.

Physical versus psychological addiction

The American Psychological Association defines addiction as an overwhelming urge to take a drug or to engage in a behavior even when we know it will be harmful to self or society. There are two types of addiction: physical and psychological. Physical addiction occurs when the body becomes so used to a particular substance that it leads to biological reactions when the substance is no longer present. People with physical addictions experience physical symptoms of withdrawal that include headaches, nausea, fevers, tremors, and even hallucinations. These physical reactions can be very harsh, and in some cases, they may become life-threatening if they occur without a doctor's supervision.

Psychological addiction occurs when our emotional and behavior patterns become so dependent to certain experiences that we feel very uncomfortable when those experiences are missing in our routines. These experiences almost always involve chemical reactions; withdrawal symptoms can be very strong and may include both emotional and physical reactions such as irritability, strong mood swings, increased anxiety, cold sweats, racing heartbeats, and an inability to concentrate or focus. The physical reactions are never life-threatening, but the emotional symptoms may be if they lead to suicidal actions or risky behaviors.

Physical addiction almost always includes psychological addiction as well. Psychological addiction may include some lesser elements of physical addiction, but not always. People can become addicted to substances like cocaine or heroin or methamphetamines, or they may become dependent

on certain addictive behaviors like gambling, shopping, playing video games, or watching pornography. Not every addiction is equally strong, and the strength is usually demonstrated by the intensity of withdrawal symptoms. Researchers recognize signs of addiction when the user tries to stop and then suffers some form of withdrawal. Evidence of physical or emotional symptoms of withdrawal can indicate actual addiction.

Marijuana does not appear to be physically addictive. Nevertheless, users can develop a dependency and become psychologically addicted to marijuana resulting in both physical and psychological withdrawal symptoms.

Tolerance and marijuana

Regular substance abuse or frequent experiences of addictive behavior will lead to tolerance. This happens with any psychoactive drug or behavior that stimulates dopamine receptors. Tolerance occurs when the stimulating or euphoric effects gradually fade after each use, causing users to take more of the drug or engage in different variations of the activity in order to achieve the same feeling they experienced when they first started.

Tolerance may be acute, chronic, or learned. In most cases, tolerance caused by marijuana is acute, which means it is temporary and lasts anywhere from a few days to many months. Even heavy users may be able to return to the same level of dopamine sensitivity as they were before using if they stop taking the drug for six months or more. This is usually true for adult users but may not be true for younger users (teenagers) who take marijuana while their brains are still in development.

Recent research suggests that marijuana use at young ages (12–18 years) may involve chronic tolerance, which means the diminishing effects may be permanent. Chronic tolerance is usually caused by physical changes to the neural receptors in the nervous system, which permanently limits the users' ability to experience the same reactions. Tolerance does not affect craving or judgment, so the user may still desire the drugs as much as ever, but they are less able to achieve the same sense of satisfying effects that they first remembered. Chronic tolerance can occur in young people or in habitual users who take very high doses (usually from concentrates).

Marijuana can also lead to learned tolerance, which is a behavioral adaptation that comes from long-term use. That means that users can be physically impaired by the drug but still may not show any symptoms. Through habitual practice, marijuana users may learn to adapt to the routine tasks of a normal day without outside observers noticing that they are

under the influence. They experience the same cognitive impairments, but they may not feel the effects in the same way.

Dependency versus addiction

Tolerance very often leads to dependency because users try to reclaim the same intense experiences by increasing their dosage and frequency of use. Eventually, the body begins to adapt to the drug always being in the system. The human body craves balance (called homeostasis), and if something new is added to the system, then the body compensates with physical and emotional changes that make the new addition seem more normal. That adaptation creates dependence. Once a user becomes dependent on a drug (or a behavior), then they will suffer symptoms of withdrawal whenever that substance (or behavior) is ended.

Dependency is not the same as addiction. People may suffer the symptoms of withdrawal, but if they are able to resist the urge to take the drug or engage in the behavior long enough for the body to readjust back to its normal condition, then they avoid addiction. Cravings from drugs that involve chemical dependency can be very difficult to resist and usually involve some doctor's supervision. Marijuana does not seem to involve a chemical dependency. Nevertheless, cravings from psychological dependency are often just as difficult to resist.

Users who have underlying mental health issues or who are using the drug to escape personal frustrations may find the psychological cravings more difficult to resist because they are (in part) reacting to some underlying conditions. Drug use will not solve the personal problems and may even make them worse, so the user feels a strong urge to fall back to their drug use as way to escape. This cycle can only be broken if the user resolves the underlying issues. Usually, psychological addiction requires some form of counseling to treat. Marijuana addiction almost always requires such counseling.

If the craving for the drug becomes so strong that the user is unable to stop using even when they know that it is harmful, then the user becomes addicted. Marijuana addiction is called marijuana use disorder.

Debate over marijuana addiction

Not everyone who uses marijuana becomes addicted. Statistics gathered since the 1970s suggest that most people who smoked marijuana prior to 2000 did not develop addiction. However, after the wave of states legalizing marijuana for medical and recreational use in the 2000s, the rates of

marijuana addiction increased. Government statistics indicate that more than 70% of Americans who develop a drug problem began their history of drug use with marijuana. There is strong correlation between marijuana use and problematic drug addiction.

Correlations do not determine causation. It is very difficult for researchers to determine what actions definitely cause which social results: Is the rise of addiction due to marijuana legalization, or is legalization due to increasing rates of marijuana use? Is marijuana use a reflection of higher rates of drug use, or does it contribute to a drug culture that leads to addiction? These questions cannot be answered decisively because marijuana addiction is psychological, not physical. There may be any number of causes for addiction that are not related to the *Cannabis* plant. The lack of clear answers fuels the debate over further legalization of marijuana.

23. Is marijuana a gateway drug?

Throughout the 20th century, marijuana was always considered a gateway drug because of its strong association with the drug culture and with users who developed addictions to more potent substances like heroin, cocaine, and methamphetamines. At the start of the 21st century, after a wave of states began legalizing marijuana for medical and recreational purposes, these presumptions were challenged. Nevertheless, statistical evidence shows that marijuana use at early ages makes users significantly more likely to engage in other drug use or to develop addictions later in life.

Understand the "gateway" concept

By 2010, it was popular among pro-marijuana websites to dismiss the idea that marijuana made users more likely to engage in later more dangerous drug use. These critics point to the fact that marijuana is not physically addictive, and therefore, users do not develop cravings for harder drugs just because they take marijuana. They also pointed to evidence that indicates most marijuana users never take other more dangerous drugs, and therefore, marijuana clearly does not force users to become drug addicts later in life.

Many of these points are accurate. However, these popular arguments also misinterpret the concept "gateway drug." The National Institute of Drug Abuse (NIDA) affirms that "marijuana use is likely to precede use of other licit and illicit substances and the development of addiction to other substances." The idea of a "gateway" is based on the likelihood and

probability that one action will lead to another. It does not mean that one action will always lead to another—that is, causal connection, not a probability connection.

There are no causal guarantees with human behavior. That means people can (and often do) take marijuana and never develop an addiction to it, and they may never take other drugs or become addicted to other substances. Nevertheless, the probability of becoming addicted and the likelihood of someone developing an addiction to other drugs is significantly greater for a marijuana user than it is for someone who has never taken marijuana. In that way, marijuana is certainly a gateway drug.

Marijuana is not the only gateway drug. Binge drinking of alcohol among high school seniors also increases the likelihood that users will engage in illicit drug use later in life. To a lesser extent, so too does tobacco use at young ages. The difference between each substance is in the level of probability. Teenage marijuana users are more likely than teenage alcohol users, and both are more likely than teenage tobacco users to take more dangerous drugs and develop addictions later in life. When two or more of these substances are taken simultaneously and more frequently, then the probability of later addiction is even higher. Alcohol, tobacco, and marijuana use at young ages is usually symptomatic of life choices that increase the likelihood of later drug addiction.

Why marijuana is a gateway drug

Marijuana is primarily taken for its euphoric effects, and for this reason, it impairs decision-making, inhibitions, and behavioral choices. Marijuana affects the part of the brain that controls inhibition and moral judgment, and it changes users' understanding of the difference between a good idea and a bad idea. It also lowers inhibitions, which makes users more likely to engage in risky behavior than if they were not on the drug.

Most of these effects wear off shortly after each use, but since the primary psychoactive agent in marijuana, tetrahydrocannabinol (THC), is attracted to and stored in fat cells, the imperceptible effects of THC can last longer than the short-term euphoric sensations. Evidence suggests that for heavy users, inhibitions and moral judgments may be impaired for as long as six months after use. Habitual users who take marijuana once a week may never be completely free from the impairment. Young users (teenagers) may develop permanent changes to the prefrontal cortex of the brain, which may lead to lifelong impairment.

If marijuana use decreases inhibitions and increases the likelihood of risk-taking behaviors, then it is easier to understand why marijuana

users may be more likely to experiment with other drugs. Sober users who might never try cocaine or heroin in normal situations may become more willing to experiment with those drugs when impaired by marijuana use. The risk of physical and psychological addiction to opioid drugs even after a few uses is very high. In that way, the pathway from marijuana use to later addiction is not difficult to trace.

Primed for addiction

Marijuana is not physically addictive, but it is highly susceptible to psychological addiction. This is because it triggers dopamine reactions, which the brain normally uses as a reward system for when we feel satisfaction or a sense of achievement after completing an important task. Marijuana bypasses the normal work that is required to achieve that sense of satisfaction and taps into the reactions biochemically. For example, instead of studying hard to ace the exam in order to achieve a sense of satisfaction, the marijuana user simply takes the drug and experiences a more intense version of the same satisfaction, even if they failed the exam.

Behavioral psychologists say that the more we train ourselves to seek rewards using artificial means (like drugs), the more difficult it is to go back to seeking rewards that require the harder work. These habits often develop into addictions because users train themselves to seek immediate sensory gratification through artificial means and learn to avoid tasks that require more extensive effort or that involve delayed gratification. Habits of drug abuse in one area (like marijuana) can prime the user for more drug abuse in another area.

In the field of neurophysiology (scientists who study the central nervous system), researchers have found that the neural transmitters associated with dopamine will actually change their chemical signatures after persistent drug use. The brain is not used to excessive and frequent dopamine stimulation, so it deals with habitual drug use (like marijuana) by taking over additional neural receptors from other areas of the brain so that it can become more ready for higher dopamine stimulation.

A drug addict's brain may become permanently primed for dopamine, which means the neurotransmitters become "hardwired" so that they are always ready for a new drug. The young user (teen) may stop taking marijuana, but if their brain becomes primed for dopamine reactions, then they live in a constant state of preparedness looking for more marijuana or for similar stimulation provided by another kind of drug. People who never take marijuana do not have these predispositions.

A variety of factors in drug abuse

A gateway drug does not mean that every user who takes marijuana will move on from one drug to the next. It does mean, however, that the probability of future addiction or future use of harder drugs (cocaine, heroin, methamphetamines, ecstasy) increases. Marijuana, alcohol, and nicotine each prime the users' brain to be more receptive to further drug use.

Most people who use marijuana never move on to use harder drugs. That means that there are also other factors that help to determine drug use and addiction. Some of these factors are genetic. The American Psychological Association estimates that half of the motivations behind addiction are due to genetic predisposition that makes users more likely to abuse certain substances over others. Other factors include family environment, local community culture, and social situations. People who have greater access and exposure to drugs are more likely to abuse them. Younger users who start marijuana (or any drug) as teens are more likely to develop habits that lead to addiction. People who are suffering from mental illness or are more susceptible to anxiety disorders and depression are also more likely to develop addiction. Also, people who live in a subcultural community that promotes drug use are also more likely to abuse drugs.

Marijuana is not the only cause for someone later developing a substance abuse problem. Nevertheless, marijuana use may become a sign of vulnerability for later addiction. More than 70% of Americans who suffer from substance abuse began their first drug use with marijuana. People who avoid all drugs (marijuana, alcohol, and nicotine) are many times more likely than users to avoid later addictions.

24. What is marijuana abuse?

Prior to the late 1990s, when marijuana was illegal at both the federal and state levels, any use of the drug was considered an "abuse" of the drug. After individual states began legalizing marijuana for medical or recreational purposes in the 2000s, then the definition of "abuse" changed. Marijuana can be used without necessarily abusing it if it is used legally and in a way that is not harmful to self or others. The definition of "abuse" is based on the user's intentions and on legal restrictions.

The difference between casual use and abuse is not always easy to determine. In general terms, drug abuse usually involves either dependency or addiction. Whether that first use of marijuana turns into an addiction or into abuse depends on many factors, including the reasons why someone

started using to begin with. Users who begin taking marijuana out of a desire to escape or avoid a difficult personal issue or situation have a much higher likelihood of developing an addiction later. This is because avoidance does not solve the underlying problem, and the drug use can become a tool that eventually makes the underlying problem worse. People who take marijuana (or any drug) as a form of escape are much more likely to develop addictions. Their use is often a form of abuse.

Younger users (from 12 to 18 years of age) also face much higher risks that their first use will turn into abuse, leading to addiction later in life. Brain development is not complete until around age 24, and because marijuana directly impairs the prefontal cortex that is responsible for learning, memory, and judgment, then any use of marijuana may lead to permanent damage. Unless they are using marijuana under a doctor's order, teen users are (by definition) abusing the drug because they risk harm to themselves. This is especially true for users who are prone to depression, mental illness, or other anxiety disorders because they are also more likely to develop addiction.

The frequency of use does not automatically determine abuse. Generally, any use of a substance against the recommendation of a doctor or the use of a substance that is against the law is considered abuse. Recreational marijuana is legal in many states, but driving a vehicle while using marijuana even one time is always illegal in every state. Using marijuana and then engaging in irresponsible behavior (like driving) is always considered abuse because it significantly increases crash rates that may harm self and others. Taking marijuana at any time when it may interfere with interpersonal relationships and job or school performance are also forms of abuse. Anytime someone takes a drug when they know it is harmful is a form of abuse. The line between "casual use" and "abuse" depends on why the user is taking the marijuana.

25. What are the signs of marijuana abuse?

No one plans on becoming dependent on anything—whether it is gambling, online pornography, alcohol, or marijuana. Something that begins as a form of recreation slowly turns into a habit or routine, and if we are not careful, we can become dependent and addicted either physically (as with alcohol or harder drugs like methamphetamines, cocaine, or heroin) or psychologically (as with marijuana or some other behaviors).

Lifestyle choices can contribute to the risks of dependency. If a drug or addictive behavior becomes integrated closely into a daily or weekly

routine, then it is easy to fall into habits of abuse. There are hundreds of addiction treatment centers online that deal with drug abuse and addictive behaviors, and almost all these websites list common signs that a user may have developed a substance abuse problem. The signs of marijuana use disorder are very similar to what you would expect from any other drug addiction. Some of these warning signs include the following:

- The user wants to stop but does not seem to be able to; they keep taking marijuana even after pledging to themselves (or others) that they will stop.
- The user experiences physical symptoms of withdrawal when they try to stop, which might include increased anxiety and depression, irritability and anger, sleeplessness, lower appetite, nausea, and a fixation on wanting to take marijuana to satisfy the craving.
- The user continues to use even when marijuana becomes more expensive than they can afford.
- The user takes risks or engages in risky (sexual) behaviors in order to have access to the drug.
- They use marijuana even when the experience is no longer pleasurable.
- The user spends a lot of time thinking about marijuana and always ensures they have access to it.
- The user continues to take the drug even they know there could be serious legal, financial, or social consequences (they could lose their job, they could be arrested or kicked out of school, or the continued use could end their relationships with others).
- The user justifies their marijuana use as a form of self-medication or uses the drug even when doctors recommend against it (or changes doctors in order to find a recommendation).
- The user finds themselves isolated from people they love as a result of their drug use; they prefer to be alone rather than face other people's judgment, or they gravitate toward new friends who support their habit and lose touch with the friends and family who disapprove.

These signs are common to any substance abuse. According to the Department of Health and Human Services, the surgeon general's report on alcohol, drugs, and health indicated that more than 20 million Americans suffered from addiction in 2017. Of that number, only 1 in 10 addicts sought treatment. Statistics from 2016 suggest that only 10% of marijuana users become addicted, but those numbers are drawn from surveys of people who self-report their abuse. The actual number of people suffering

from marijuana use disorder is probably much higher than commonly estimated.

The most effective means of identifying marijuana abuse is to consider the lifestyle choices of the user. If the drug plays an important role in daily or weekly routine or if it dominates the topic of conversation or if influences the choice of friends, then there is a good chance that it is being abused.

26. How much marijuana can I take without becoming an abuser?

The most common question about marijuana among high school students is very practical: How much marijuana can I take before I get hurt or addicted or in some other kind of trouble? The first answer is that any use by a teenager almost always involves abuse. With very few exceptions for medical use, every state prohibits recreational marijuana by minors just as they prohibit consumption of alcohol for minors. This is because marijuana can lead to serious developmental issues and may cause permanent damage to learning, memory, and motivation. The simple answer is that any amount of marijuana use by teenagers should be considered abuse.

The deeper questions students are asking relate to dependency: At what levels of abuse will I become psychologically addicted? At what point will I see my grades suffer or when will my family begin to notice problems or my relationships with other nonusers become strained? At what point will my health be compromised? How much marijuana is too much, and how often? These questions are more complicated and depend on many variables including the user's genetic predisposition, personal and family experiences, and the dosage and frequency of use. To better understand their risk, students should ask themselves certain key questions.

Is there evidence of abuse in my family?

The American Psychological Association notes that genetics may be responsible for nearly half of a person's vulnerability to addiction. If your parents, aunts, uncles, and grandparents have any history of substance abuse, then there is a strong chance that you may also be vulnerable. In addition to genetic factors, environmental factors also play an important role. If your family is struggling with any kind of addiction at home, then you may be influenced by life choices that promote habits of dependency.

If you or your family spends much time with friends who have substance abuse problems or if you hang out at places marked by substance abuse, then you are at greater risk of imitating those behaviors.

Last, if you are prone to anxiety disorders, depression, or other forms of mental illness, then you are at greater risk of dependency and/or developing psychosis. Marijuana may not cause mental illness, but there is strong evidence that it increases susceptibility and problematic symptoms of mental illness. Addiction becomes more likely as does the risk of psychosis. If any of these variables apply to your life situation, then you are more vulnerable because your social networks are already primed for dependency. Higher vulnerability means that it may take only a few occasions for you to develop a habit and eventually a dependency on marijuana.

Why am I taking (or considering) marijuana?

If you are struggling with difficult personal issues and are looking for a temporary escape, then you are more susceptible to addiction. Similarly, if you start taking marijuana through peer pressure or out of insecurity to fit into a group, then also you are more vulnerable. Such issues are not resolved by drug use and rarely go away on their own. Whatever triggered the initial use will very likely influence additional uses later. Unless the issues that are causing the initial frustration are addressed, you are more vulnerable to developing a dependency.

How am I taking marijuana?

The method and dosage of taking marijuana can determine the strength of the experience and the probability of developing acute tolerance. Smoking marijuana usually produces the quickest effects, but they also fade more quickly than other methods. Since the 2010s, most marijuana varieties contain about 10% tetrahydrocannabinol (THC), with some varieties containing as much as 25%–30%. Higher concentrations of THC are more likely to result in acute tolerance in a shorter period of time. Developing tolerance to any drug increases the likelihood of dependency.

Tolerance depends on body size, the amount of available fat cells, and metabolism rates. For some people, daily use for two or three weeks will result in noticeable tolerance effects. For others, regular use for six months may be required. Tolerance does not always lead to dependency or addiction. Heavy users take T-breaks (tolerance breaks) for anywhere between one and six months to regain their sensitivity to marijuana. However, if users shift their drug of choice from marijuana to something else (like alcohol) but never completely end their drug use, then they

are only shifting the cause of dopamine tolerance from one substance to another, but the tolerance issue remains unchanged. If you are forced to address problems of tolerance and T-breaks, then you are likely already experiencing dependency issues.

Other methods of taking marijuana rely on THC extracts. Tinctures and edibles may have THC concentrations as high as 95%, and depending on how much of the extract is added in the food, the actual dose of THC may be significantly higher than the amount taken through smoking. Since THC in edibles is broken down in the digestive system, the user may have to wait an hour or longer before effects kick in. Users may keep eating thinking that nothing is happening, and then suddenly the effects begin, and the user is unable to limit what they have already eaten. Marijuana overdoses occur most often when taking edible products.

Vaping produces quicker results than edibles, and users are more able to manage their doses. At the same time, the THC dabs used in vaping machines may contain extremely high concentrations and often contain other contaminants that the user has little control over. These contaminants may even include other more addictive drugs like opioids (fentanyl is popular). Since the actual ingredients of the dab are unknown to the user, there is much greater risk of accidental overdoses or of becoming physically addicted to a non-marijuana drug. There have been many cases where a user vapes just once and suffers permanent damage to their health (including death) due to contaminated THC concentrates.

Last, if you are taking marijuana with any other drug, then you have very high vulnerability. The most common drug is alcohol (usually taken before the marijuana), which increases the intensity of impairment. Other common drugs are opioids and methylenedioxymethamphetamine (MDMA, also known as ecstasy). Urban police statistics reveal that very high percentages of youth (in some cases 90% or more) between the ages of 18 and 24 who participate in the dance club culture often take three or more drugs at the same time. These polydrug combinations are responsible for the highest death tolls due to drug overdose. Marijuana is often a central ingredient, and any polydrug use will very likely result in addiction.

There is no single answer to this question. Marijuana affects every individual differently. The users' age, family history, home environment, and personal motivation for using marijuana play important roles in determining susceptibility to dependence and addiction. Other factors, including body type, metabolism rates, tolerance levels, and dosage also play roles in the likelihood of whether even a single use (or a few uses) may result in immediate physical dangers to health or future dependency.

Statistically, most people who use marijuana occasionally do not become dependent or develop an addiction. At the same time, most

people who later become addicted to other drugs like methamphetamines, cocaine, or heroin began their drug use with marijuana. More than 10% of teens who begin smoking marijuana will develop marijuana use disorder within a year (compared to 6.4% of adults). That means that there is always some risk involved with marijuana use. Generally, higher doses taken frequently increase the likelihood of dependency and substance abuse, but other social and genetic factors are probably more important in determining the ultimate level of risk.

27. How do the health risks of marijuana compare to the health risks associated with alcohol and tobacco?

A 2019 survey conducted by the Harvard School of Public Health reported that twice as many Americans believed alcohol was more harmful than marijuana, and three times as many believed tobacco was more harmful. There are many social and political reasons that might explain this trend in public perceptions, but this widespread public misconception does not reflect scientific fact. In terms of physical and mental health risks, marijuana is significantly more dangerous than tobacco. It is just as dangerous to the internal organs as alcohol but is more likely to be abused than alcohol. Of the three drugs, marijuana also poses the greatest risk to mental health, learning, and judgment.

Alcohol, tobacco, and marijuana are all addictive either physically or psychologically, and though they each may pose fewer health risks if used in moderation, all three substances can be dangerous if abused or used to excess for long periods. None of these are "safe" for teens because their minds, bodies, and faculties of judgment are still developing. Each drug carries different dangers. Marijuana provides very high risks to both the lungs (when smoked) and the liver (when eaten) and the greatest risks to brain functions, especially in terms of the risk of psychosis and long-term impairment to learning, memory, and judgment. Tobacco poses risk to the lungs but has little to no impact on the brain because it is not psychoactive. Alcohol may pose some risk to the brain and internal organs (especially the liver), but it is also the most likely of the three to be consumed without being abused.

Tobacco risks

The main addictive ingredient in tobacco is nicotine. It is a mild stimulant, but it is not psychoactive. It does not affect judgment. The primary

danger of tobacco does not come from nicotine itself, as much as from the smoke that brings the nicotine into the body. The other chemicals that enter into the lungs can permanently damage respiratory function, which can lead to cancer, heart disease, stroke, diabetes, and chronic pulmonary disease (COPD).

These risks, however, are not due to the nicotine. They are due to the process of smoking. All these risks are compounded when smoking marijuana. Studies suggest marijuana smoking is at least three to seven times more dangerous to the lungs than tobacco smoking for two reasons. The first is that marijuana smokers do not use any filters, whereas tobacco-based cigarettes almost always have filters. The filter cuts down some of the toxins from the smoke, but not all of them. The second reason is due to the peculiar way users smoke marijuana. In order to achieve the greatest euphoric effect, marijuana is inhaled deeply and then held in the lungs for as long as possible before being exhaled. That means the marijuana smoke stays in the lungs significantly longer than tobacco smoke for each use. Marijuana smoke contains twice as many cancer-causing polyaromatic hydrocarbons.

Smoking marijuana poses substantially more dangers to the lungs and internal organs than smoking tobacco. The main difference emerges from frequency. Heavy tobacco users may smoke 10 cigarettes or more in a single day; therefore, the risk from heavy tobacco smoking may be higher than occasional marijuana smoking (once a week). However, due to the density of smoke, daily marijuana use still poses a higher risk of cancer and other smoke-related diseases than tobacco. Recent studies indicate marijuana users have a 20% higher risk for cancer and other cardiovascular-related diseases than regular tobacco users.

The risk of physical dependency on tobacco is higher than marijuana, which does not appear to be physically addictive. However, since tobacco does not produce any psychoactive effects, the risks of psychological dependency on marijuana is substantially higher than tobacco. Users smoke marijuana to achieve the euphoric effects, and if they begin using it as a tool for dealing with difficult personal issues, then the risk of dependency is very high. There are no risks of psychosis or other mental diseases from tobacco, whereas marijuana increases both risks significantly. Tobacco users will never develop hallucinations, suffer panic attacks, or increased paranoia like marijuana users.

The risk to others from secondhand smoke is roughly the same between tobacco and marijuana, except that marijuana is typically not smoked in public places (especially in states where it is illegal), and therefore, bystanders are less affected. Tobacco use might be more of a public nuisance than marijuana smoking, but that might change as more states

legalize recreational use of marijuana. Danger to fetal development (for pregnant smokers) is high for both tobacco and marijuana, but marijuana has the added potential of harming the baby's cognitive functions.

Alcohol risks

Alcohol can produce mild euphoric effects if consumed to the point of intoxication. It also impairs muscular coordination and other motor functions, lowers inhibitions, impairs memory, and may lead to poisoning (and death) if taken at very high doses. Alcohol can become physically addictive, but it requires habitual use. More often, users will become psychologically dependent long before they become physically dependent. The risk of a physical alcohol dependency is not as high as the risk of psychological marijuana dependency. Typically, dependency on either alcohol or marijuana requires counseling to break the psychological addiction first.

The main difference between alcohol and marijuana is that alcohol may be consumed without producing any intoxicating effects at all. Most people drink alcohol for the taste, not to reach the point of intoxication. Statistically, more than 70% of alcohol users drink without ever feeling the effects of alcohol, because they limit their consumption to one or two drinks. Alcohol does not appear to carry any health risks if it is limited to once or twice a day (depending on gender). Some studies indicate that alcohol consumption once a week may provide health benefits. The serious dangers of alcohol are not triggered until the user takes so much that they become intoxicated. This is called binge drinking, and it requires at least four or five drinks taken within an hour.

By contrast, every marijuana user experiences impairment every time they use because that is the only reason why they are using. That means the risks of marijuana use are triggered with every use. Any effective comparison between the relative risks of alcohol and marijuana should consider the effects of moderate marijuana use (once or twice a week) to binge drinkers (those who consume at least four to five drinks in an hour, once or twice a week). In 2012, there were slightly more adults who regularly engaged in binge drinking than there were those who regularly used marijuana (8.6 million vs. 5.1 million). By 2019, those figures were balancing out with the number of binge drinkers declining and the number of regular marijuana users increasing. Among teens, marijuana abuse became more common than binge drinking. In 2019, nearly 20% of high school students took marijuana at least once a month, whereas only 13.5% of the same students engaged in binge drinking. The risk of abuse is higher for marijuana than for alcohol.

Most of the risks from alcohol abuse are short term while the user is intoxicated. The same risks of impaired judgment, impaired driving, loss of inhibition, and irresponsible decision-making are about the same when someone is intoxicated by alcohol as when they are impaired from marijuana. The risk of auto accidents is the same for both. Excessive alcohol if taken quickly in high concentrations can pose acute risks. Those who drink hard liquors (like whiskey or vodka) very quickly may induce alcohol poisoning that leads to unconsciousness and, in some cases, death. Typically, alcohol consumed through lower doses (beer or wine) will cause the user to become sick or unconscious before they reach deadly levels. Excessive use of marijuana will not kill directly.

Death by alcohol poisoning most often affects men in their late forties, suffering from severe alcoholism (about 0.0007% of the population). Direct alcohol poisoning is rare, but death through risky decisions while under the influence of alcohol is much more common (0.0274% of the population). Drunk driving and other accidents cause about 40 times more deaths per year than alcohol poisoning. The cognitive impairment from marijuana can lead to the same level of risks as alcohol: lower reflexes, impaired judgment, and increased likelihood to take risks. In both cases, when a user is intoxicated from either substance, they lose their ability to make responsible decisions. The secondary risk of death through impaired decision-making is the same for both alcohol and marijuana, though slightly more people engage in regular marijuana use than in regular binge drinking.

The physical health risks for long-term abuse are somewhat similar. Extensive alcohol abuse can cause damage to the liver and digestive system, cause heart disease, and increase stroke risks. The psychological and social risks of alcohol dependency are similar to any substance abuse disorder. Users may develop physical and learned tolerances so that they appear to function normally in their jobs, but the physical tolls continue. Social risks are the same for any substance abuse that leads to psychological dependency; these are the same for both alcohol and marijuana. Alcohol can be dangerous to others if the user drinks while pregnant. Alcohol may impact fetal development and, in serious cases, lead to fetal alcohol syndrome that can cause permanent brain damage and impair growth development in children that cannot be reversed.

Marijuana risks

Marijuana produces euphoric effects that primarily impair cognition, memory, perception, and inhibition, with less noticeable effects on muscle

coordination. It does not appear to be physically addictive but is more likely than alcohol to become psychologically addictive. Unlike alcohol or tobacco, marijuana is a mild hallucinogenic that influences visual and auditory perceptions.

Smoking marijuana leads to greater health risks to the lungs and the related cardiovascular system than smoking tobacco. Since the early 2000, an increasingly larger percentage of users take marijuana through concentrated extracts used in vaping e-cigarettes or in tinctures and edibles that are consumed orally. Vaping does not involve smoke, so puff for puff, it is safer for the lungs than smoking tobacco. Nevertheless, vaping still involves heat and carries a high percentage of other contaminants present in the concentrated mixture (or dab). Most of the serious reactions that lead to emergency room visits from marijuana users come from vaping products. In 2019, more than 2,500 hospital visits were reported after marijuana vaping products were discovered to contain small amounts of rat poison. The CDC and FDA both issued warnings that vaping products pose inherent risks and that no vaping products have been authorized for medical use.

The most popular forms of marijuana extracts are tinctures and edibles, especially in the form of candies, gummies, and baked foods (like brownies or cookies). These forms of ingestion do not pose any risks to the lungs, but they still pose risks to the liver and other internal organs. Like alcohol, the tetrahydrocannabinol (THC) from of marijuana is broken down and processed through the liver. Increased marijuana use in any form places greater stress on the liver, though to a lesser extent than alcohol. The greatest risk from edibles is dosage control. Edibles account for the most common source of dangerous overdosing from marijuana, including intense vomiting/sickness or death following panic attacks or paranoid hallucinations resulting in harm to themselves or others (suicide, accidental death, or accidental homicide).

The greatest risks from frequent marijuana use are effects on learning, memory, judgment, and mental health. The psychoactive properties of THC act as a mild hallucinogenic, which combines euphoric feelings with distorted perceptions that can influence mood, attitudes, and personal convictions. Like alcohol, these temporary effects also impair muscle coordination, which means that the intoxicated user is at increased risk of car crashes and other dangers from risky decision-making. Unlike alcohol, some of these side effects of cognition, learning, and memory remain even after the user is no longer intoxicated. Depending on frequency or use, the THC can be stored in fat cells, which gradually release at low levels into the system for days, weeks, or even as long as six months after use. Chronic marijuana use significantly increases the risk of psychosis and other psychiatric diseases.

Health risks of marijuana use are comparable to the risks associated with regular binge drinking. They are much higher than the risks associated with moderate drinking that does not result in intoxication (one drink for women and one to two drinks for men). The risks to other people are similar while users are impaired, and both marijuana and alcohol also carry increased risks to fetal development in pregnant mothers at any level.

Summary

In 2021, rates of alcohol addiction appeared to be slightly higher than rates of marijuana addiction among the adult population except that marijuana addiction rates are usually underreported. Statistics also rarely account for polydrug addictions (alcohol and marijuana and tobacco or marijuana and other physically addictive drugs like opioids or amphetamines).

The abuse of any drug can lead to death—if not directly, then in association with risky behaviors and increased probability of deadly diseases. Among the three drugs, only tobacco has no effect on risky behaviors. Binge alcohol drinking and marijuana use both impair judgment and decision-making. If alcohol drinking is limited (drinking less than required for intoxication), then it poses much less risk than marijuana, which always involves some level of impairment. More than 70% of alcohol users drink limited amounts that do not reach any level of intoxication. By contrast, all marijuana users reach the level of intoxication every time they use.

Since 2002, alcohol has become less of a threat to high school students and marijuana has become more of a threat. By 2021, tobacco use among American teens is at an all-time low (and is also low for the adult population). Alcohol use among teens is slightly lower than it had been in 2000 as it is among the general adult population. By contrast, marijuana use among all age groups and especially among teens increased. More teen users abused marijuana than alcohol (by 50%), and more teens abused marijuana than tobacco (by 800%). In part, the shift in youth drug use is due to the widespread misconception that marijuana is less dangerous than alcohol or tobacco.

28. What are the most common social effects of marijuana abuse?

By definition, marijuana abuse means that the user is unable to stop taking the drug, and they continue to take the drug even when they know it is hurtful to themselves or others. Most marijuana abuse disorders go undetected because marijuana is a mild hallucinogenic that directly affects

judgment and promotes delusions of success. This causes many users to feel like their drug use is under control and is not hurtful to themselves or to others even when outside observers see it much differently. These side effects can disrupt relationships that impact family, friends, and coworkers or other colleagues. Like any other substance abuse disorder, marijuana abuse develops slowly over time, and most users do not realize that they have become addicted until after they begin to experience serious social consequences of their habit.

Effect on relationships

Marijuana lowers inhibitions immediately after use, and many users believe it helps them to better relate to those around them. This is short term. After the initial stages of impairment, marijuana usually increases the users' sense of paranoia—the feeling that the people near them are somehow intending to do them harm. At this stage of intoxication, the user often isolates themselves, and they become less sociable.

Even if users do not act less sociable, the sober people around them may find the intoxicated user more difficult to be around. In extreme cases, heavy doses of marijuana may induce a panic attack or hallucinations that trigger irrational reactions. In almost all cases, the user loses the ability to focus or communicate in a logical manner. As the effects of the drug wear off, the euphoric effects are often replaced by a great tiredness. Some users often fall asleep, and others with learned tolerance just slow down. In either case, the user becomes less connected to those around them.

Daily marijuana users can learn to adapt to the drug effects and manage to hold down jobs even if they are continually under the influence at some level. Users can complete their daily routines and hide their impaired thinking and motor functions by reacting more slowly and limiting themselves to simple tasks. Nonusers who are around them all notice the effects of the drug even if they do not know which drug the user is taking. They see someone who is easily confused, often quick to form illogical judgments, and who makes risky choices. These behaviors usually add strain and stress to existing relationships.

Personal and social isolation

The National Institute of Health reports that many daily marijuana users develop amotivational syndrome, which is a general decline in personal motivation for anything. That means that chronic users feel less urgency to complete tasks, even when they are important to friends, family, and

the people they love. Job and school performance usually declines, and the user feels more isolated but tends to blame other causes rather than the drug (which they believe is actually helping them).

Habitual marijuana users spend a lot of time trying to get, use, and recover from the aftereffects of the drug, because marijuana dominates most of their life decisions. The preoccupation with drug use takes time away from other priorities, and abusers often fail to complete tasks and find themselves letting others down. These habits prompt abusers to avoid nonusers who do not seem to understand the importance of their drug use. Instead, they tend to gravitate toward new friends and situations where marijuana use is accepted.

At the same time, marijuana increases the sense of paranoia that often prevents users from venturing into new settings with people or places that are unconnected to their drug use. Marijuana use can stunt emotional and academic development. Research indicates that long-term marijuana use results in lower IQ points and lower achievement, both of which can harm relationships with others. These behaviors increase the sense of isolation, which is usually made worse by the accompanying feeling of paranoia that marijuana stimulates.

Effects on other people

Users who suffer from marijuana use disorder often achieve lower socioeconomic status than nonusers; they tend to have increased difficulty in academic and social settings and are also more likely to abuse other substances like alcohol or other illicit drugs. If the abuser lives in a house with children, then the children are more likely to develop the same symptoms of substance abuse disorder themselves. Children in such households are also more likely to suffer from abuse or neglect and have higher rates of mental and behavioral disorders. In 2017, one in eight children lived in households that included one or more parents with a substance abuse disorder (alcohol, marijuana, or other illegal drugs). The social effects of marijuana abuse are mostly the same as any other substance abuse disorders.

29. Is there a connection between marijuana abuse and mental illness?

There is a strong association between marijuana abuse and mental illness. Researchers are not certain whether marijuana causes initial mental illness or if the drug merely increases the likelihood that people who are

already vulnerable will develop mental illnesses. In either case, the risk of developing psychosis, schizophrenia, bipolar disorder, depression, or other anxiety-related disorders increases significantly with marijuana use, especially among young users (teenagers) and those with family histories of mental illness.

Correlation versus causation

The National Alliance on Mental Illness reports that one-third of patients diagnosed with schizophrenia use marijuana frequently. The CDC similarly reports that heavy users are more likely to engage in suicidal thoughts, and long-term users are more likely to develop social anxiety disorder, which means that sufferers become unusually anxious about ordinary daily interactions and are constantly afraid of being judged by others. Habitual marijuana use also increases the risk of bipolar disorder, which is when the user swings back and forth between "up periods" of energetic excitement and optimism to "down periods" of depression, sadness, and a general lack of motivation or hopefulness.

Mood and emotions are difficult to measure biochemically, so researchers cannot be certain if cannabinoid reactions from marijuana cause temporary or permanent changes to the central nervous system. That means that it is almost impossible to determine if marijuana causes mental illness. Nevertheless, there are strong correlations with mental illness. Researchers can measure what happens in the short term after someone takes marijuana, and these risks include sudden panic attacks or psychosis, which is a break from reality when the user hears voices or sees hallucinations or when the user experiences unreasonable fears (paranoia) that people are out to persecute them. These short-term risks can be measured while they are happening, and they almost always fade away within 24 hours, just like the other cognitive effects of marijuana.

A 2017 Study from the *American Journal of Psychiatry* reported that half of all patients who experienced marijuana-induced psychosis eventually developed schizophrenia or bipolar disorder later. Scientists do not know exactly how the drug affects the brain, and it is not impossible that some permanent damage to perceptions, mood sensitivity, and judgment may occur even after minimal marijuana use. The vast majority of marijuana users do not slip into psychosis after a single dose of marijuana. Nevertheless, a large percentage of people who suffer from schizophrenia and psychosis also take marijuana. There is a strong correlation, but not the kind of evidence necessary to show causation.

Teens who take marijuana regularly (weekly) are twice as likely to experience mental disorders, including mania and bipolar disorder, later in life, and female users are five times more likely to develop depression or anxiety disorders. These statistics suggest that marijuana may be causing permanent changes to the central nervous system at some level that researchers are unable to detect.

Anxiety and PTSD

Marijuana is frequently prescribed off label to treat anxiety disorders, including post-traumatic stress disorder (PTSD). Most clinical evidence suggests marijuana actually makes these conditions worse. Users think that the drug helps relieve their anxiety issues because they feel the immediate effects of euphoria, well-being, and relaxation after taking the drug. These effects are temporary and are due to altered perceptions because marijuana is a mild hallucinogenic. The drug cannot resolve the underlying issues that originally caused the anxiety. At best, it can help the user avoid the issue. However, if the drug is used as a tool for avoidance, then the drug is likely compounding the problem. That is why most mental health professionals are in strong agreement that any drug use (including marijuana) usually makes problems of anxiety and depression worse.

Ending marijuana use may be difficult, especially for those who are already prone to depression. Any user who develops dependency will experience withdrawal symptoms when they try to end their marijuana habit. Symptoms include tiredness, lower energy, and worsening of depression and anxiety. The last two symptoms can make people who already struggle with anxiety or depression more likely to relapse into using the drug as they attempt to avoid the withdrawal symptoms.

Treatment complications

Research reported by the American Psychological Association indicated that patients already suffering from schizophrenia, bipolar disorders, or anxiety disorders should stop taking marijuana to ensure more successful treatment results. This recommendation holds true for any illicit drug or alcohol, but marijuana is especially problematic because it creates a temporary sense of euphoria and well-being that may convince the user that all is well, even when it is not. Delusions of grandeur, which can cause users to feel more intelligent and powerful than they actually are, appear to linger even after the temporary effects of the marijuana wear off.

Habitual users run higher risks of permanent damage to their judgment and ability to easily distinguish a good idea from a bad idea. These side effects greatly undermine treatment plans that attempt to encourage users toward more positive behavior choices. Users who take marijuana as a form of self-medication are especially vulnerable because they usually do not take into account family history, genetics, or childhood traumas that may increase risk of mental illness.

30. Can marijuana use and abuse kill you?

Marijuana use does not appear to cause death directly, even if taken in very high amounts. But the evidence is not absolutely clear on this point. The primary psychoactive ingredient in marijuana is tetrahydrocannabinol (THC), and since the early 2000s, legal and illegal manufacturers developed increasingly potent THC concentrates. Since the mid-2010s, after the legalization of recreational marijuana use in several states, poison control centers and emergency rooms have reported a spike in the number of overdoses and questionable deaths related to THC. In addition, the number of deadly motor vehicle accidents due to THC has also increased significantly.

Direct risk of death

For nearly 50 years prior to the 2010s, scientists frequently stated that marijuana overdoses cannot kill the user directly. Up until the 2000s, most marijuana was smoked, and the concentration of THC per dose was relatively low (between 3% and 10%). After legalization of medical marijuana in the mid-1990s, certain varieties of marijuana plants were grown with extremely high THC levels, and by the 2010s, some of these plants reached THC levels of more than 30%. At the same time, both legal and illegal manufacturers began developing THC concentrates that could contain as much 90%–95% THC. Once these products reached the legal (and illegal) markets, the number of overdose cases and questionable deaths increased significantly—by as much as 34% per year between 2009 and 2015.

The most common source of overdose cases come from edibles, which have a delayed reaction time of up to an hour or more. Edibles are typically 5–20 times more potent than smoking marijuana, but because the THC is processed through the digestive system instead of the lungs, the effects take 60–90 minutes before they are felt. Overdoses most often

occur because users take a little of the edible and feel no effect during the first hour, so they take a lot more hoping to speed up the process. By the time the THC begins to affect the central nervous system, there is already 20–50 times more drug than the user expected, and they fall into overdose.

Most cases of marijuana overdose symptoms include rapid heartbeat (from 20% to 100% faster), increased anxiety, vomiting, and difficulty breathing. In many cases, the user falls into psychosis, where they hear voices or see hallucinations, which is usually accompanied by panic attacks and/or intense feelings of paranoia. These overdose symptoms do not usually include death. However, in 2014, three separate cases (two young men and a woman) involved patients who died, and doctors could not find any other cause except the presence of THC in their system. The number of deaths that involve only THC use has increased every year since 2015.

Synthetic THC (known as "K2," "Spice," or "Black Zombie") was criminalized nationally in 2017 because of its potential health risks. K2 is not derived from marijuana, but it contains molecules that are extremely close to THC in their shape, and so they produce the same effects as marijuana, only stronger. Synthetic THC increases the risk of internal bleeding, may stop breathing, lead to paralysis and seizures, and may induce comas. In many cases, these symptoms also lead to death when left untreated. There is little difference between synthetic THC and natural THC found in marijuana except in the level of potency. As the potency of THC concentrates taken from *Cannabis* plants continues to increase, the risk that an overdose may cause direct death also increases. Current researchers do not know if and when that point becomes likely, but the possibility remains that THC concentrates used for vaping (dabs), in tinctures, or in edibles may become potent enough to cause lethal overdoses.

Whether it is a *Cannabis*-based THC extract or a synthetic THC compound, doctors do not know for certain if THC causes death or if the overdose symptoms pushed certain people with preexisting conditions over the edge. There are no cannabinoid receptors in the heart and lungs, which is why most researchers claim that marijuana is never deadly. Yet if someone already had a weak heart and the marijuana increased heart rate, then that could trigger a heart attack. Statistics show users are 4.8% more likely to develop a heart attack within an hour of smoking. That does not mean that the marijuana causes heart attacks, but it certainly increases the risk of death for people with preexisting heart conditions. Even if marijuana overdoses do not directly cause death, there is increased risk of death for users who already have certain preexisting conditions.

"Risk of death" versus "Cause of death"

Marijuana may not directly cause death, but there is no question that it increases the risk of death for all users. In the same way that tobacco use also never causes death directly, it would not be accurate to say that smoking is always safe or that it does not increase the risk of death. There is ample evidence to show that smoking tobacco increases the risk of cardiovascular diseases significantly, which explains why each pack of cigarettes includes a warning from the surgeon general that smoking can kill you. Smoking marijuana is three to seven times more likely to cause cancer than smoking tobacco, which means that all the deadly associations of tobacco use also apply to marijuana use.

Several studies from the 1990s and early 2000s tracked the mortality rates of marijuana users (aged 15–49) over the course of 10 or 15 years. When they accounted for other risk factors (such as tobacco use, alcohol use, and family histories), most of these studies found that marijuana users were generally at a higher risk of death by any cause than people who did not use marijuana at all. These correlational studies are not absolutely reliable because there may be any number of reasons for the increased risk of death than were unaccounted for. Nevertheless, there is evidence to support the idea that marijuana users tend to engage in lifestyles that carry increased risks of death.

The risk of death is not the same as a direct cause of death. Motor injury accidents are the leading cause of deaths in the United States, and there is no noticeable difference between risk of lethal accidents from alcohol impairment or from marijuana impairment. Both are equally deadly in terms of auto-crash probability. A 2016 study of over 239,739 motor vehicle crashes found THC increased the odds of crashing by 20%–30%, and researchers suggested this estimate was lower than the actual risk because an accurate record of THC is not always measured at crash sites due to the speed at which it leaves the bloodstream). Other reports from 2019 indicate that THC is found in the bloodstream of up to 40% of fatal crashes. Other drugs are also present in these cases, including alcohol.

Marijuana users are also more likely to use other drugs. In 2020, the United States experienced the highest number of overdose deaths ever recorded. As of 2020, U.S. mortality reports only identify the primary cause of death from drug overdose, and since marijuana does not appear to cause death directly, U.S. statistics do not record the number of cases where marijuana was also present. In other European countries, though, all drugs are included in mortality reports, and in 2017, THC was found in 21%–38% off all fatal overdose cases. The numbers might be higher in the

United States because marijuana is frequently combined with fentanyl, and fentanyl is the leading cause of death in cases where more than one drug was present.

Suicide and drug addiction

In 2014, a 19-year-old college student bought THC-laced cookies from a legal marijuana dispensary in Denver, Colorado. He ate just part of a marijuana cookie, and after an hour, he felt no effects, so he ate the rest of the cookie. During the next two hours, he fell into a panic attack due to extreme paranoia, exhibiting harsh outbursts, and eventually jumped out of a fourth story balcony and died. The only drug in his system was from the single cookie: 65 mg THC (which is much higher than that in a single marijuana cigarette, but typically lower than most THC candies and cookies, which often have 100 mg THC). The student suffered psychosis after only one dose from the cookie. During the same year, in the same town, a man ate some THC-infused candies, and after an hour, he also suffered psychosis and began experiencing hallucinations, which caused him to launch into paranoid outbursts, threatening his wife and children, and finally prompting his wife to call the police. While she was on the phone, he took a gun and shot her dead.

The risk of harm to others or self-inflicted death is high with any substance abuse disorder. The risk of psychosis is higher for marijuana than some other drugs, but it is not the highest risk. Risk of self-harm is also high when abusers try to end their addiction. One of the common symptoms of withdrawal is increasing feelings of depression, hopelessness, and sadness. This can turn to suicidal thoughts, though there is no evidence that any drug causes suicide. There are strong correlations between drug addiction and suicidal ideas and attempts. During 2020, the same year of record drug overdoses, the nation also experienced a record number of suicide attempts and successful suicide deaths.

It is true that marijuana will probably not cause death directly. It is not true that marijuana carries no risk of death. The risk of death is increased significantly anytime an individual loses control over their judgment or decision-making or if they fall into psychosis. These risks are increased even further when muscular coordination is impaired. Every year, thousands of people die with marijuana in their system—often as the only substance, and more often as one of many substances (including alcohol, opioids, and other illicit drugs). No one can know for certain whether the victim would have made the decisions they made if they had not taken

marijuana first. As with any drug, marijuana use increases the risk of death significantly.

31. I want to stop using marijuana. What treatment plans are available?

The National Institute for Drug Addiction notes that patients suffering from marijuana use disorders have, on average, been using marijuana every day for more than 10 years and have tried to quit at least six times before they sought treatment. Most people diagnosed with marijuana use disorder also have other addictions or mental illnesses that can be treated at the same time as their marijuana addiction. The internet is filled with thousands of websites that advertise local and national addiction treatment centers. These websites often provide summaries of marijuana abuse and offer services that help users end their addictions.

The good news is that every addiction is treatable. Some of these treatment plans may be completed at home, and others may require the user to remove themselves completely from the places where they practice their habits; these are called in-patient programs, and they typically last up to 30 days. These are also called detox programs because they provide a safe place for users to wait while the drugs leave their body. In some cases, the withdrawal symptoms may be harsh and could require medical supervision.

Most treatment centers also combine therapy sessions for other activities that help the user to break the habits and routines that were so strongly associated with their drug abuse. Some of these programs include cognitive behavioral therapy, contingency management, and motivational enhancement therapy. Cognitive behavioral therapy teaches users to adopt strategies that help encourage greater self-control and discourage the previous behaviors that led to addiction. Contingency management is another therapeutic program that focuses mostly on specific triggering behaviors with the goal of removing the positive rewards that typically lead to addiction. Motivational enhancement therapy focuses more on teaching the user to increase their interpersonal desire to change their lifestyle so that they actively seek out sober living. Various treatments may use one or more or all these techniques to help users overcome their overwhelming addictive urges.

Most patients undergoing treatment will suffer relapses, when they fail to maintain their recovery goals, and fall back into addiction. This is

very common, even among patients who eventually live their lives free of addiction. Most treatment centers expect their patients to relapse, so they encourage posttreatment programs that focus on maintaining a sober lifestyle. These programs often involve self-help groups, such as Marijuana Anonymous, Alcoholics Anonymous, and Narcotics Anonymous, though other local programs may exist under different names. In addition, patients often seek individual therapy sessions to work on the underlying psychological issues that may have prompted the addiction in the first place.

Unlike alcohol, cocaine, heroin, or other drugs that involve physical addiction, there are no drugs that will relieve the withdrawal symptoms from marijuana use disorder. Addiction to marijuana is mostly psychological in nature; therefore, almost all treatment options require some therapeutic element. The most common advice offered by addiction treatment centers is to seek help immediately if you suspect you may have a problem or if your loved ones have indicated that you might have a problem. Early intervention is always easier than struggling with long-term habitual use.

The Substance Abuse and Mental Health Services Administrations provides a free website that connects users to potential treatment providers at https://findtreatment.gov/.

Marijuana Policy and the Law

32. Why are marijuana policies so controversial?

Most therapeutic drug policies are not controversial. When a company develops a new medicine to control cholesterol or a new drug to control blood sugar or almost any other therapeutic drug, the general public is always very supportive. New drugs developed to solve specific medical problems generate very few controversies. Most drugs only become controversial when there is a high risk that they may be used for recreational purposes. Drug abuse causes harm to the user, to their families, and to their community, and when the public suspects that a drug is highly prone to abuse, then it is controversial. Marijuana is controversial because it is so frequently abused.

Controversy of medical marijuana

The *Cannabis* plant, or marijuana, is prone to abuse. Medical marijuana is legal in most states, but it is still used more frequently for recreational purposes than for therapeutic purposes. For most of its history, the variant of marijuana that people smoked was recognized by almost every society as a dangerous drug because it distorted perceptions and was usually linked to crime and vice.

The idea that marijuana may have some medicinal value came about very late in history—mostly in the United States shortly after 1970.

The Controlled Substances Act (CSA) of 1970 classified marijuana as a Schedule I drug, which meant: (1) it was highly susceptible to abuse; (2) it had no current medical use; and (3) doctors did not know how to use it for medical purposes in a safe way. The CSA grouped marijuana with other drugs that were also likely to be abused (heroin and cocaine) and that were not used to treat any medical condition. The Drug Enforcement Agency (DEA) grew out of the previous Bureau of Narcotics and was responsible for regulating all potentially dangerous drugs to ensure that people who peddled them to the public would be caught and punished.

Not everyone agreed with the classification system of the CSA, and pro-marijuana advocates began looking for ways to prove that marijuana was different from the other drugs in its category. One of the main purposes for researching the medical uses of marijuana was to remove the drug from its Schedule I classification and reclassify it at some other level (either Schedule II or Schedule III), which would allow for fewer regulations and make the drug more easily available to the public. Every drug in the Schedule I classification is most highly regulated and most likely to lead to jail time if abused. The idea of medical marijuana was mostly a reaction to the CSA.

Drug classification system

Doctors cannot prescribe drugs in the Schedule I category without very specific guidelines for the purposes of research. For example, doctors do not prescribe heroin to treat any sickness, so anyone who makes and sells heroin would go to jail if they were caught. Doctors can prescribe other medicines in the Schedule II category because they can be used to treat specific conditions. If researchers could find a specific condition that marijuana could treat, then it could be moved to another category.

Most Schedule II drugs are based on narcotics (opium-based drugs called opioids) and stimulants (like methamphetamines) and are included in about 500 other drug combinations sold under thousands of different names. These drugs may be just as dangerous (in some cases, more dangerous) than Schedule I drugs and are just as likely to lead to abuse as Schedule I drugs, but they have specific medical purposes. That means doctors can write prescriptions for them to be administered in safe and controlled ways. Schedule III drugs are similar to Schedule II drugs except that they are less likely to be abused (less likely to lead to addictions or to be sold through illegal drug dealers for recreational purposes). Schedule IV and Schedule V drugs are least likely to be abused, but they are still controlled by doctor's prescriptions.

The main difference between Schedule I drugs and all the others (II, III, IV, and V) is that Schedule I drugs are not given out to the public as medical treatments, and so their use and distribution is highly regulated by law enforcement. Drugs in the other Schedules (II, III, IV, and V) all have some medical use, so they are regulated mostly by doctors and pharmacists through the use of prescriptions. Law enforcement often gets involved with regulating Schedule II and III drugs, but only when the drugs are sold illegally through underworld dealers without a prescription. The illegal market for legally prescribed drugs is the leading source of drug abuse in the United States.

The Tenth Amendment and marijuana legalization

As of the early 2020s, the federal government continues to classify marijuana as a Schedule I drug, which means it is illegal to sell or prescribe for medical purposes at the federal level. In 2018, Congress passed the Hemp Farming Act, which allowed farmers to legally grow *Cannabis* for cannabidiol (CBD), but not for its tetrahydrocannabinol (THC). Since then, marijuana farmers can legally grow the hemp variety of *Cannabis* as long as the psychoactive element (THC) is below 0.3%.

The federal government can decide if some products are legal or illegal, but most law enforcement is actually conducted at the state level. Since 1996, beginning with California, various states passed laws that legalized *Cannabis* for medical use. Since 2012, some states (beginning with Colorado and Washington) also legalized marijuana for recreational use. These state laws violate federal laws, but since most law enforcement for drug violations occur at the state level, states can choose for themselves what to enforce. The Tenth Amendment to the U.S. Constitution says that any power that is not specifically given to the federal government is left to the state governments. Since marijuana production is not listed in the Constitution, that means that states can decide for themselves if it is legal or not.

That means California may allow someone to legally set up a marijuana retail shop, but that retailer may still be violating federal laws. The federal government has told states that they will not send drug enforcement agents into states where the drug is legal. However, if the retailer attempts to sell their products to other states or if buyers try to transport the drugs over state lines, then the federal government can arrest them.

The fact that marijuana is only legal in some states, and only for some purposes, makes marijuana controversial in terms of the law. Banks who operate in multiple states fall under federal jurisdiction. They do not want

to loan money to marijuana businesses, even if they are legal in a certain state (like Colorado, for example), because the federal government may seize funds or prosecute transportation if the product crosses state lines. Also, since bankruptcy laws are all handled at the federal level, marijuana businesses cannot claim bankruptcy if their business collapses. Investing in marijuana business carries a heavy risk.

Legal controversies

Why is marijuana still illegal at the federal level as a Schedule I drug if so many states have passed laws declaring marijuana has some medical use? Marijuana may be used to treat certain medical conditions, but it is not the preferred treatment for any condition. Marijuana is controversial because many people do not believe that legalization of medical marijuana is actually intended to help medical treatments. Most opponents believe medical marijuana is a stepping stone toward legalizing recreational marijuana. Statistically, even in states where marijuana is legalized for medical use, most users still take marijuana primarily as a recreational drug. The idea that marijuana provides genuine therapeutic treatment remains highly controversial.

There are very well educated people on both sides of the debate. On one side, advocates for more relaxed drug laws usually follow three different lines of argument. The first line argues that drug laws do not stop drug use. Law enforcement agents can send people to jail, but that does not always ensure that abusers are receiving the help they need to end their addiction. They also claim that marijuana is so frequently abused that criminalization leads to too many people going to jail. Instead, these advocates believe marijuana should be legal and the money that is currently spent on law enforcement should be used to support addiction treatment centers.

The second line of argument in favor of legalization says that states can earn much money if they tax marijuana sales. The added tax revenue would more easily fund drug treatment centers for those who develop an addiction. The third line of reasoning argues that marijuana is mostly harmless, and if it is harmful, then it only hurts the individual using it and not the people around them. This line of argument often also supports legalizing recreational use in the same way that alcohol is legalized.

Opponents of marijuana legalization argue that medical marijuana is just an excuse to open the pathway to popularizing the drug as a first step toward complete legalization of marijuana for recreational use. As a matter of historical trends, states where recreational marijuana is legal usually began the process by first legalizing it for medical use. In Oregon,

for example, legal medical marijuana in 1998 eventually led to legal recreational marijuana in 2014, and six years later, in 2020, the public voted to legalize small amounts of any drug for personal use (such as heroin, cocaine, methamphetamines, or other addictive Schedule I and II drugs). The movement to legalize medical marijuana is controversial because people who oppose recreational drug use worry that medical legalization is just the first step to full legalization.

Culture war

Those who oppose legalizing recreational drug use argue that drug abuse always harms the community and society at large. Drug addiction is not a "victimless" crime because it hurts three groups of people. First, it harms the user directly. Even if the drug is not deadly, drug addiction increases medical costs overall because drug dependency causes users to neglect other aspects of their health, and users are more likely to fall into disease. Second, drug addiction harms the families of drug addicts who also suffer neglect and may suffer direct physical or psychological abuse as a result of the addiction. Houses with substance abuse typically have access to fewer available resources. Last, addiction also harms the community of the drug addict, because the user is removed as a productive member of society and is more likely to turn to crime to support their habit. Drug users may feel like they are only hurting themselves, but no one is completely alone in society, so a single person's drug use can indirectly affect thousands of people in their community.

The debate over marijuana is part of a larger culture war between groups of people who hold conflicting values about the importance of individual accountability, productivity, and the role of government oversight.

- Those who oppose marijuana legalization tend to believe that marijuana is a dangerous drug that the society needs to maintain some control over.
- Those who support marijuana legalization usually believe that marijuana is harmless and that there are more important issues that the government should focus on instead of drug enforcement.

Those who want stronger drug enforcement laws believe that the government must actively protect individuals, families, and society from the dangers of drug addiction. Those who want more relaxed drug laws usually believe recreational drug use is a private matter and that the government should regulate the activity through taxation rather than criminalize it.

Whether or not a government legalizes drug use says much about the values a society most tries to preserve and protect, and since the 1990s, there has been considerable political controversy between these different cultural viewpoints.

33. When did marijuana (and hemp) become restricted/ prohibited by law?

The marijuana plant (also known as the *Cannabis*) has been cultivated for almost 5,000 years. That does not mean people have been smoking and using marijuana freely as a drug for thousands of years or that it has only been regulated or criminalized recently. Marijuana use has almost always been limited to the fringe elements of any society.

For most of its history, only the less-psychoactive varieties of *Cannabis* plants were cultivated as hemp and grown exclusively for textile purposes (to make rope and cloth). Hemp farmers in the 1700s did not use or sell their crops as a drug. Only a small variety of *Cannabis* plants were grown for their psychoactive effects as a drug, and these crops were much more limited in scope and rarely cultivated beyond that required for a single individual. With few exceptions, until the 19th century, marijuana was mostly used as a drug only for ceremonial or ritualistic purposes in limited areas around the world. Most people in Europe and the United States, the common workers or farmers or people in business, rarely even knew that marijuana was a drug or how it was used. Hemp farmers were not drug farmers.

Hemp textile

The *Cannabis* plant comes in two main varieties, and for most of its history, the nonpsychoactive variety was cultivated as a crop called hemp. The earliest examples of string or rope or cloth came from natural plant fibers. Flax was most common and was used to make linen as early as 30,000 years ago, which was more than 25,000 years before the first cities or civilizations (or the discovery of bronze and writing) were developed. Ancient hunter-and-gatherer societies picked grasses, took bark off trees, or used the leaves of certain plants and rolled them out into long thin fibers. These were intertwined into string, which was then knitted (and eventually woven) together to form cloth. Flax was used first; then cotton came a few thousand years later. Wool from sheep was not used until they were domesticated around 5,000 years ago, and China first cut open the cocoons of silkworms to extract silk threads around the same time.

The first archaeological evidence of *Cannabis* plants being used for textiles dates from around 4,800 years ago in China. The use of hemp spread from China to the Middle East and Egypt and then to Europe within a span of few hundred years. The ancient Greeks were familiar enough with hemp cloth that they coined the word *Cannabis* to describe the plant. *Cannabis* is also the root word for *canvas*.

During the modern era, hemp was legal because it was not viewed as a drug. When the psychoactive variety of marijuana became more widely abused as a drug in Western nations, then all *Cannabis* plants fell under more strict controls. By that time, synthetic fibers replaced hemp as the main source of textiles, so all varieties of *Cannabis* were limited to avoid confusion, since they look similar to each other.

Marijuana use as a drug

The earliest archaeological evidence of marijuana grown for its use as a drug was discovered in the tomb of a shaman in China around 2,800 years ago. Drug use existed in ancient times, but alcohol was much more commonly available. The fermentation process that creates alcohol is almost unavoidable and occurs anytime sugar and grains are mixed together and allowed to sit in the sun for any length of time. Wine, beer, and other intoxicating drinks emerged shortly after the development of agriculture, about 10,000 years ago. Drugs also existed, but drinking alcohol was the most common way that any people became intoxicated.

From the earliest times, every society has made a distinction between alcohol and drugs and treated each differently. Safe use of drugs requires special knowledge of unusual herbs, and their effects were often unpredictable. For example, certain mushrooms in meso-America produce hallucinations, while other mushrooms in the same vicinity can kill you immediately, and still others have no effect at all. These sorts of dangers forced even the most primitive societies to limit drug use to certain specialized individuals who were trained (or experienced) in identifying proper roots, herbs, and other poisons. These people were known as shamans or witch doctors or some other word to describe a person with special mystical knowledge. There is very little evidence of significant drug abuse in any ancient or premodern society.

Real doctors versus fake doctors

The line between healer and magician was very thin in the earliest eras of medicine. Most shamans or healers combined their herbs and potions

with spells and incantations. The first Chinese emperor Qin Shi Huang was prescribed a potion of mercury, gold, and other ingredients that was supposed to let him live to be hundreds of years old. Of course, he died immediately because mercury is very poisonous. Ancient shamans used many types of drugs, but they did not really understand what the drugs were doing to people.

The ancient Greeks were the first to treat medicine as a practice that did not require religious formulas. Hippocrates wrote down careful observations of the effects of certain herbs and potions and even experimented with various treatment options. Though he never mentioned *Cannabis*, his list of herbs included poppy seeds (source of opium) as a pain reliever and other practices like massage therapy, exercise, and healthy diets to avoid disease.

Doctors did not really understand the internal functions of the human body (like blood circulation) until the 1700s. Nevertheless, the scientific revolution and other innovations of the 1800s sparked strong public interest in finding chemicals and treatments to heal any ailment. The public believed new medicines could potentially cure anything.

Unfortunately, the hope for scientific success was faster than actual scientific understanding. During most of the 1800s, certain opportunistic doctors and unscrupulous scam artists took advantage of public excitement for medical miracles to sell magic cures. The fake salesmen traveled from town to town peddling tonics, ointments, or powders to people wanting miracle cures. These concoctions usually contained high amounts of alcohol, so the user felt some effect, but they were rarely effective. In some cases, the potions included strychnine or opium or other potentially dangerous chemicals like radium that made users sick (and sometimes die) after taking them. As real science became better understood, these fake-science salesmen faced increasing public criticism, resulting in new laws criminalizing the abuse of medical drugs.

American drug enforcement

By the start of the 20th century, widespread immigration and increasing global trade created very large cities throughout the major ports of the United States, which prompted the federal government to pass more laws to protect urban centers. In 1906, the Pure Food and Drug Act outlawed the interstate transport of unsafe foods or illegal drugs. In 1906, though, doctors still did not completely understand which drugs were safe and which were prone to addiction, so few drugs were actively regulated.

During the American Civil War, doctors used opium (and morphine) to relieve pain from traumatic injuries, and many soldiers who were given morphine in the hospital developed an addiction after they returned home. Drug abuse was a relatively rare problem in the 1910s, but it had become serious enough to warrant more federal action. In 1914, the Harrison Narcotics Act regulated the interstate sales of opium and cocaine. It only required opium and cocaine importers to register, pay a tax, and to track where the drugs were distributed. However, if doctors gave out drugs for nonmedical uses, then both the doctor and the user could go to jail. Many clinics were shut down, and people were sent to federal prison for drug violations. Nevertheless, drug abuse was still mostly limited to urban areas, and federal laws had little impact on cities and their police departments.

Alcohol was always the most popular means of intoxication, and after World War I, the nation experimented with a national reform movement, outlawing the sale and manufacture of alcohol, called Prohibition. During the 1920s, most Americans stopped drinking, but there were many examples of drinking at illegal bars called speakeasies in urban areas. Speakeasies became a central location for other illegal activities, including gambling, prostitution, and drug use—mostly, opium and cocaine, but after the war, an increasing amount marijuana also came in from Mexico. Hollywood films during the 1920s frequently told stories of alcohol and drug abuse in urban settings. This increased public support for prohibition among rural folks, but it also created an impression of a wild "jazz age" in urban settings. Most of the public pressure for reform was directed toward alcohol during the 1920s, but there was also a growing awareness of a potential drug problem as well.

Marijuana enforcement

In the midst of Prohibition, medical doctors continued to develop new drugs. Amphetamines were discovered in the late 1880s but were not widely developed as a stimulant and possible treatment for asthma until the 1920s. Doctors were still uncertain as to exactly what amphetamines did to the body, so during the 1930s they were prescribed for anything from depression, weight gain, morning sickness, and narcolepsy to even as a treatment of postintoxication hangovers.

Prohibition of alcohol was overturned at the federal level in 1933, but many rural towns and counties continued to outlaw alcohol (some even do so today). Alcohol could be consumed without intoxication, and public

reformers focused instead on marijuana and other drugs that always produced intoxication. The Federal Bureau of Narcotics was created in 1930 to enforce the laws that regulate the illegal use of opium and cocaine. They were also the first national agency to notice the association between marijuana and the criminal underworld, because it was often used and sold at speakeasies.

Since it was previously used mostly in Mexico, southwestern border states began passing laws regulating and criminalizing marijuana. The Bureau of Narcotics proposed legislation to heavily regulate the growth, manufacture, and sale of marijuana at the federal level. The Marihuana Tax Act of 1937 placed very heavy regulations on *Cannabis*, eventually leading all states to ban the drug as an anti-crime measure.

The 1950s' pharmaceutical revolution

After World War II, new antidrug laws were passed that carried strong sentences for dealers who illegally sold drugs for nonmedical purposes. Opium, cocaine, heroin, and marijuana were targeted most. By the late 1950s, these laws were changed to also include illegal use of amphetamines.

At the same time, after the war, the medical community shifted from research into wartime traumas to peacetime family practice. In the early 1950s, scientists finally understood how to isolate and synthesize hormones to provide new treatment options for hundreds of conditions, from heart disease to diabetes, cancer, and reproductive and development disorders. Doctors were suddenly able to give pills to cure ailments that had previously been untreatable.

During the 1950s, medical psychiatrists developed new sedatives to cope with depression and mental illnesses. They also experimented with new treatments for schizophrenia using the hallucinogenic properties of certain mushrooms. This resulted in the invention of lysergic acid diethylamide (LSD) and later phencyclidine (PCP), which were intended to treat psychological disorders. Each new medical development also created new opportunities for abuse, when the drugs were used for recreational instead of medical purposes.

The "War on Drugs"

The post–World War II baby boomers reached adulthood during the 1960s and began experimenting with recreational drug use more than any previous generation in history. The growing drug culture reached national attention, and the 1963 Presidential Commission on Narcotic and Drug

Abuse recommended less emphasis on police enforcement and more focus on drug rehabilitation. More federal resources were devoted to treating drug addiction and less to law enforcement.

The number of baby boomers experimenting with illegal drugs continued to rise, and by 1969, Richard Nixon launched a successful campaign on the promise that he would reduce public access to dangerous drugs and more actively enforce existing drug laws. He was the first president to call for a "War on Drugs." During his first term, Congress passed the Comprehensive Drug Abuse Prevention and Control Act of 1970, which included the Controlled Substances Act (CSA).

The CSA replaced all preexisting federal drug laws and created a new system for classifying drugs according to their risk of being abused, their usefulness as a medical treatment, and their ability to be prescribed safely. Marijuana was listed as a Schedule I drug along with cocaine and heroin, because it was highly prone to abuse and was not currently used as a medical therapy for any condition. Any use of Schedule I drugs was considered abuse, because they had no medical value. The Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) was also created to enforce regulation of these laws. In 1973, the Drug Enforcement Agency (DEA) was created specifically to concentrate on fighting the War on Drugs.

During the 1980s, President Reagan redoubled efforts to crack down on illegal drug use, with greater attention to keeping schools free from recreational drug use. Shortly after the United States adopted a national approach to drug enforcement, British lawmakers also adopted a similar strategy. The British Misuse of Drugs Act established similar classification systems in 1971.

Conclusion

Marijuana has been cultivated since ancient times, but it has never been used by a large percentage of any population. Drug abuse was largely unknown as a social problem until the rise of global trade routes and new large industrial cities during the 18th and 19th centuries. *Cannabis* grown for rope, cloth, and other textiles was legal, but marijuana used for recreational drug purposes was always limited by social pressures. Marijuana was eventually outlawed along with other drugs that were abused for nonmedical purposes as soon as they became noticeable as a social problem in urban areas. The modern American movement to legalize recreational drug use (including marijuana) is unique. As of the early 2020s, it is unclear what the long-term results of such laws will be.

34. My state legalized marijuana, so can I still get arrested for using, growing, buying, or selling it?

Many states have passed laws that legalize marijuana for medical use and, in some cases, for recreational use. The Tenth Amendment to the U.S. Constitution allows states to decide for themselves how to deal with matters that are not explicitly provided for under other sections of the Constitution. Drug enforcement and most other criminal codes are not explicitly mentioned in the Constitution, so states are left to decide how to handle these issues.

That means that each state establishes its own rules and criteria for growing, selling, or using marijuana. Almost all states require growers to register and pay a tax to obtain a grower's license. States that only allow medical marijuana require users to see a doctor to be screened before they can receive a prescription (or, in many states, a marijuana card). In states where recreational use is legal, users must be over the age of 21. These provisions are common, but each state may choose to change or modify specific requirements whenever they like.

Users may still be arrested for marijuana even if they live in states where *Cannabis* is legal. If only medical marijuana is legal, then users without a doctor's prescription or without their marijuana card may face fines. Depending on the state, underage users or anyone barred from using marijuana due to criminal convictions, court injunctions, or some other reason may also be prosecuted for taking marijuana—even if recreational marijuana is legal in their state.

Some states, like California, Oregon, and Nevada allow users to grow and use marijuana without a grower's license as long as it is intended for personal use. Almost every state, though, requires retailers to register and pay taxes for the right to commercially sell *Cannabis* in any form. Most states will prosecute illegal sellers who provide marijuana or other THC extracts without authorization. Illegal vendors are routinely arrested in California for failure to abide by the registration process, pay licensing fees, or for selling their products without checking age or other restrictions.

Marijuana may be legal in your state, but growing marijuana for drug purposes continues to be illegal at the federal level. As of the 2020s, it was still classified as a Schedule I drug, which means it is highly prone to abuse, it is not currently used as therapeutic treatment, and there are no established medical protocols in place to ensure it can be used safely. The 2018 Farm Bill allowed farmers to grow *Cannabis* for its cannabidiol (CBD) content because the FDA approved a CBD extract (Epidiolex)

as a treatment for two rare forms of epilepsy that affects very young children. However, under the Controlled Substances Act of 1970, marijuana remains illegal to buy, sell, or grow for its tetrahydrocannabinol (THC) content without specific authorization for select growers to cultivate and use it for research purposes.

Generally, the federal Drug Enforcement Agency (DEA) does not pursue and arrest marijuana cases in states where marijuana is legal. This policy depends on the directives of the current presidential administration. In 2013, under President Obama, the U.S. deputy attorney general issued a memo stating that federal agencies would not prosecute marijuana cases. In 2018, under President Trump, the Department of Justice (DOJ) issued another memo stating that it would enforce all federal laws regarding marijuana. In 2021, under President Biden, the DOJ rescinded their previous memo. In any administration, anyone who tries to transport marijuana across state lines is considered a drug trafficker and is liable to arrest and prosecution.

35. Is it illegal to buy marijuana products online?

Marijuana remains illegal at the federal level, and any transport of illegal drug products over state lines is a form of drug trafficking. If the online retailer resides in another state, then they (and you) could be liable to prosecution if the drug is shipped across state lines. Marijuana retailers who use the internet to advertise may deliver products within their own state, and (depending on the state), such purchases could be legal.

Each state chooses how to regulate marijuana, whether for medical use or for recreational use. Typically, in states where medical marijuana is legal, users must be able to demonstrate to online retailers that they are legally able to use the drug. The same is true for recreational use of marijuana. It is very difficult to prove that an online buyer is over 21 years of age, so most legal marijuana dispensaries do not provide online options. Nevertheless, some states (including Arizona, California, Colorado, and New York) allow marijuana delivery services to people with approved certification and identification.

Marijuana products that do not contain tetrahydrocannabinol (THC) may be legal at the federal level and often do not require any medical prescriptions or age requirements. Products that contain cannabidiol (CBD) or textiles made from hemp do not contain more than 0.3% THC and are legal at the federal level and in almost every state. These are often legally available online.

The FDA warns users that online retailers are unregulated. That means there is no guarantee that any drug or supplement will contain the advertised ingredients. Consumers cannot easily analyze CBD and other marijuana-derived products to determine quality or effectiveness. Many products advertise themselves as "hemp" or "cannabis derived" but may not actually contain any marijuana or cannabinoid elements. In other cases, online retailers may try to sell actual marijuana products that are illegal. Consumers always take a risk when they purchase products online, but the risk is increased if they unintentionally buy illegal products that cross state lines, which could trigger federal and state law enforcement.

36. Has legalization of marijuana ended the illegal drug trade?

In theory, legalizing marijuana would end the illegal drug trade because users could buy their marijuana through legal dispensaries and not have to risk arrests, poor quality, or violent encounters with criminal drug dealers. In practice, however, in every state where marijuana has been legalized, the illegal marijuana trade has increased (not decreased).

The reasons are simple. Legal marijuana is usually more expensive than illegal marijuana. States that legalize marijuana use for medical or recreational use always include some process for controlling the growth, distribution, and sale of the drug. Just like buying or selling alcohol requires special licenses, so too growing and selling marijuana (and other marijuana products) all require licenses. This increases the price. In addition, retailers also pay for advertising and the retail storefront. Adding all the taxes and fees together, the final user pays as much as three to four times the original price. Colorado collected $1.6 billion from marijuana sales between 2014 and 2020. Illinois collected $175 million in 2020 alone. That means that buyers in Illinois spent $175 million over and above the actual price of the product.

In 2021, the California legislature considered a $100 million bailout plan to help legal marijuana sellers compete. California's United Cannabis Business Association reported there were three times as many illegal suppliers as legal ones. The Massachusetts Cannabis Commission reported that about 80% of the states' marijuana sales occurred illegally in private clubs where home-growers brought their supplies to sell to other users. In every state where recreational marijuana was legalized, the illegal marijuana trade has increased.

Another reason why legalization does not decrease illegal sales is due to the nature of marijuana. It is highly susceptible to psychological

addiction. Since legalization, marijuana has become more potent, and the number of marijuana products has increased significantly. As marijuana becomes more socially acceptable, the frequency of use also increased. Between 1992 and 2014, the number of daily marijuana users increased 772%. Between 2014 and 2020, after recreational legalization, the number of daily users increased 200%. The demand for a drug increases as the rates of dependency and daily use increases. If prices are higher at legal retail shops than they are through illegal dealers, then buyers usually go to the dealers.

When fewer resources are dedicated to drug enforcement, then there are also fewer police available to crack down on illegal dealers. As rates of marijuana use continue to increase nationally, the overall demand for marijuana increases locally. This increases the rate of interstate marijuana trade (which is always illegal). As the number of legal users in one state grows, the demand for marijuana spills over into neighboring states where marijuana is illegal. Washington and Oregon legalized marijuana early in the 1990s (medical use) and 2010s (recreational use), but Idaho did not legalize marijuana for either use. Idaho reported a 665% increase in marijuana seizures in 2017, the year after Oregon made it easier to open legal marijuana shops. In 2020, there were three times as many marijuana shops in Oregon as there were McDonald's fast food restaurants, so marijuana use increased significantly across the state. The high demand for and use of marijuana in Oregon then spilled over to neighboring Idaho, where marijuana remains illegal. The illegal trade between states, and the illegal market in Idaho also increased.

Advocates for marijuana legalization argue that if marijuana was legal in every state, then the demand would balance out between regions and illegal markets would decline. Opponents for marijuana legalization argue that increasing use of marijuana creates an increase in demand, and unless marijuana is given out free, the legal markets will always be more expensive than illegal dealers. Opponents also argue that marijuana users also use other drugs that are not legalized (especially opioids and amphetamines). If the national demand for legal marijuana increases, then the illegal drug trade also increases overall. Statistical evidence supports the claim that legalization of any drug (including marijuana) also increases the demand for all drugs.

37. How does marijuana policy reflect current political or moral ideologies?

A nation's drug policy reflects more than just medical concerns. There are also moral and social issues that raise ethical questions that do not always lead to easy answers.

In terms of medical policy, the basic questions are these: How does a country ensure its citizens have access to drugs that are safe and reliable? How do lawmakers ensure that unsafe or dangerous drugs are kept away from those who are not informed enough to know better, like children? In a free society, we also consider questions that recognize individual freedom. Should patients be allowed to experiment with drug treatments, even if the drugs are dangerous (or involve some risk)? Should others be allowed to experiment with drugs even when they are not sick? What are the social costs of recreational drug use? Questions of liberty also spark corresponding questions of civic responsibility. What are the costs to society if my recreational drug use prevents me from serving as a productive member? Is it fair to the rest of society if my recreational activity creates burdens that other people must pay for, like increased health-care costs, law enforcement costs, or mental health costs?

When making or changing drug policies, lawmakers must consider the collective values and priorities of the people who voted them into office. The answer to these questions is not easy, but whenever we make a law that relates to drug use, we are answering them. If our marijuana policies begin to change, then that means that our nation's political and moral ideologies are also changing.

Drug use and culture war

Federal and state marijuana policies are part of a larger cultural war between opposing political and moral ideologies. An ideology is a set of values that people use to answer difficult questions, like the ones above. Political ideologies refer to the values that people hold with regard to the government. Should the government mostly focus on what you are not allowed to do? Or should it focus more on protecting the rights of what individuals are allowed to do? For drug policy, that means asking whether the government should forbid all dangerous drugs or whether it should provide people with enough information about the dangers of particular drugs to make their own judgments? Other questions ask whether the federal or state governments have moral authority in enforcing drug laws or in deciding whether marijuana is legal and in what forms.

Moral ideologies refer to the way we decide those boundaries between individual freedom and individual responsibility. Do my actions hurt others? How do my actions reflect my personal character? Should I follow social rules even if I do not want to? In terms of drug policy, that means asking whether legal recreational drug use creates bad examples for children, leading them to making bad choices that hurt their character. Does

legalizing marijuana make the society less polite, less respectful, and does it make people less likely to exercise personal self-restraint? Does the government have an obligation to protect the nation's moral health? People have different answers to these questions based on their political and moral ideologies.

Theoretically, there could be as many different viewpoints as there are individuals, but as a practical matter, most people tend to gravitate toward groups that they agree with. In the 21st century, the United States has become polarized on matters of political and moral values, which means that most people tend to fall on one side or another of two main divisions, and there are fewer people who fall in between. Political parties (Democrats, Republicans, or independents) are voting groups that share agreement (mostly) on certain political values. Religious affiliation (Christian, Jewish, Moslem, Agnostic, Atheist, etc.) usually represents shared moral convictions—different religious denominations often agree on many of the same principles, but not always. In a democratic society, people are usually drawn together by both their political and moral values to form alliances that increase the power of their collective votes.

When the main election issues are social or moral based, then political affiliations are less important than shared moral or economic values. Sometimes Democrats join with Republicans on moral issues (like abortion, gender issues, or drug policies), yet remain divided on other political issues (like whether laws should be state based or federal based). In a polarized society, the exact nature of the two opposing sides is hard to define because they might include similar political parties, religious, or other affiliations. Nevertheless, the cultural divide can be very strong, and if it is divided mostly along moral lines, then that is called a culture war.

Marijuana policy is part of the larger culture war because questions about whether or not people should be allowed to take drugs for recreational use are moral based. These policies may involve related questions about medical safety or health needs, but at the root, the decision to legalize or criminalize marijuana reflects values about individual freedom and the importance of moral choices. If the nation shared a common consensus on moral issues, then marijuana policies would not be controversial. However, when these questions are presented to lawmakers in a polarized society, they draw vocal debates from all groups.

Morality of recreational drugs

Recreational drug use is a moral question mostly because drugs change the way people behave and think. A drunk person cannot think clearly,

making it difficult for them to distinguish between a good and bad choice. The same is true when a user gets high on marijuana—their judgment is confused, and their inhibitions are lowered. From a moral perspective, people who are intoxicated (from any drug) are less able to restrain their actions and to make moral choices. Some of the moral issues involved with legalizing marijuana are that it may undermine society's moral health.

Alcohol is legal in every state for users over the age of 21. Recreational marijuana is legal in only some states. Both alcohol and marijuana can impair moral reasoning while under the influence. Yet unlike alcohol, marijuana also stimulates a sense of euphoria and is a mild hallucinogenic. The user may not realize that their judgment is impaired, and they may even feel confident about their risky decisions after they are no longer high.

Supporters of legal marijuana argue that the damaging effects on moral reasoning are always temporary and are no more dangerous than the intoxicating effects of alcohol. They argue that if alcohol is legal under controlled conditions (for adults over age 21 who are not driving), then marijuana should also be legal under similar constraints.

Opponents argue that marijuana is very different from alcohol. First, users can drink alcohol at low levels without ever becoming drunk, while a marijuana user will always be impaired after each use. Second, drunk users may make a poor decision, but the next day, they will feel bad about it. Because of its mild hallucinogenic effects, a user high on marijuana may not realize they made a poor decision even after they have sobered up. Some research suggests marijuana may permanently impact moral reasoning, though more research is needed to answer the question with certainty. The root moral question is whether or not it matters that someone chooses to impair their moral judgment. It is at that level that most people are divided on the question of legal marijuana.

Morality of drug habits

Recreational drug use can also impair moral judgment by creating bad habits. Users who are trained to seek out instant gratification rather than commit themselves to the hard work required to achieve longer-term satisfaction are developing habits that avoid personal self-restraint.

Opponents to recreational drug use argue that it is immoral to pursue pleasure for its own sake without also developing a corresponding sense of responsibility to balance it out. If marijuana users take the drug to seek pleasure to avoid taking responsibility, then it produces moral problems that affect society as a whole. If many members of a society chose to avoid

problems, then the problems would increase with fewer people able to solve them.

Supporters of recreational drug use argue that individual decision-making is unconnected to social responsibility. They argue that there are many different views on morality, and society should not impose a single moral code on any individual. Instead, the only consideration is whether drugs pose specific health risks and immediate threats to others. If a drug addict chooses to drop out of society, then it is their decision alone and does not harm anyone else.

The debate about individual freedom creates another issue. If recreational drug use is always freely chosen, then it only affects the user. However, drug use often leads to drug addiction. By definition, substance abuse means the individual user has tried to quit and is unable to do so. Therefore, an addict does not have the freedom to say no to their drug temptations. Addiction is very common with drug use because drugs help people avoid immediate problems. Behavioral psychologists argue that most addictions are caused by users who are faced with difficult situations but then develop habits of escape. The temporary effects of using the drug (or other addictive behavior) help the user forget and avoid the difficult underlying issue. Addiction of any kind (drugs or gambling or pornography) almost always impacts personal relationships and job performance because the user becomes obsessed with using and avoids difficult problem-solving.

For many people, there is a moral difference between recreational drug use and substance abuse. Not all recreational drug use leads to addiction, but substance abuse always begins with recreational drug use at some point. Casual use turns into an addiction when the user develops a habit of instant gratification, which makes other longer-term alternatives more difficult to follow—even if the alternative path is safer and healthier to self and to others. Those who oppose legal recreational marijuana use usually also oppose other forms of recreational drug use. They tend to emphasize the dangers of addiction and argue that users do not make free choices when they are enslaved by the overwhelming desire to take their drug. They point to criminalization and drug treatment programs as two methods for protecting the public from dangerous substances.

Those who oppose recreational drug use on moral grounds argue that bad habits will result in bad addictions. Those who support recreational drug use argue that such moral decisions should always be left to the individual alone. That is why supporters mostly focus on the immediate euphoric experience of the drug and rarely emphasize the dangers of impaired judgment or the social costs of addiction. Some marijuana

supporters do not believe marijuana carries any danger at all. Instead, they focus their arguments on the consequence of criminalization and how imprisonment affects individual opportunities and community dynamics.

Historical trends

The baby boomer generation is neither mostly on one side nor the other of the culture war. The same generation that first experimented and popularized marijuana use during the 1960s was also the same generation that launched President Reagan's "War on Drugs" campaign during the 1980s to protect their children. Baby boomers are strongly involved with both Democrat and Republican Parties, they are in religious churches (Catholics, Protestants, Jews, Muslims, etc.), and they are also in the nonreligious groups. They do not reflect any single ideology but are themselves divided along larger cultural lines.

Nevertheless, the baby boomer generation helped bring a wide variety of moral questions for political debate, which eroded the previous moral consensus. During the 1960s and 1970s, the parents of the baby boomers shared strong concern that marijuana and other drugs were threatening the potential of younger generations. During the 1980s, they aligned with the moral conservatives within the baby boomer generation to preserve the cultural moral values of individual self-restraint and civil responsibility. This coalition resulted in a strong antidrug campaign based on law enforcement that significantly lowered drug use among teens, and it represented more traditional views of morality and politics.

During the same period, however, the moral and social liberals within the baby boomer generation promoted alternative cultural values of collective responsibility, social egalitarianism, and increased government support for shared social resources. They did not support the antidrug campaign and publicly condemned the increased rate of drug arrests and incarceration among inner-city youth. The shift from Reagan and Bush administrations to the Clinton and the later Obama administrations also reflected a shift in these cultural coalitions, resulting in greater divisions between Republicans and Democrats on most moral issues. By the 2010s, Republicans and Democrats were mostly on opposite sides on the issue of drug enforcement policies.

At the same time, religious affiliation generally declined between the baby boomer generation and their children and grandchildren. Among the post–baby boomer generations, fewer people attend religious services each week, and fewer members identify with traditional religious denominations. That means that many of the post–baby boomer generations do

not rely on their religious identity to guide their moral decision-making and are instead guided more by other political or economic affiliations. By the 2010s, the liberal side of the baby boomers had forged a new coalition with the less religious sectors of the younger generations. Nevertheless, the conservative side of the baby boomers remains just as active, and as new coalitions were formed, the political contests of the 2010s and 2020s became deeply polarized.

The wave of state-based laws legalizing recreational marijuana use reflects the political success of the more liberal side of these new coalitions. It is not clear how long the current coalition will last or whether there will likely be a shift in some new directions in the future. As long as society is polarized along moral and cultural lines, it is very difficult to predict future trends because there are few points of common agreement, and the success of one side often comes at the loss of the other. Long-term questions about recreational drug use will likely shift back and forth until some common cultural consensus is reached or until the natural social consequences of long-term addiction become more widely felt.

38. Have other drug-related policy movements been affected by the movement to regulate marijuana?

The movement to legalize medical marijuana added greater pressure for the movement to legalize recreational marijuana use and to legalize other drugs that were traditionally regulated through strict law enforcement. A majority of states approved the medical use of marijuana, but only a minority of states legalized recreational use. The federal government continues to prohibit marijuana for anything but nondrug use, but all these policies are under debate.

The public pressure to legalize marijuana both reflects and encourages other drug-related policies. During the past 30 years, most cultural trends promote greater reliance on chemical and digital solutions for routine medical, psychological, and social problems. These technological changes impact individuals on a daily basis. Not everyone is in agreement, but the current cultural trends suggest greater vulnerability to dependency and less individual self-reliance.

ADHD and psychotropic therapies

The first medicines used to treat psychological disorders were developed after World War II and used to treat psychosis and depression. Psychotropic

drugs are medications that alter mood. By the 1950s, doctors frequently prescribed drugs to treat anxiety in adults. They also used newly developed drugs to treat children who appeared to be suffering from hyperkinetic reaction disorder, which was an early name for attention deficit/hyperactivity disorder (ADHD). ADHD has since become the most commonly diagnosed behavioral condition in children, affecting almost 7% of all children. ADHD symptoms were later redefined as a lifelong condition affecting both children and adults. Until the early 2000s, the most common treatment was Ritalin (methylphenidate) and Adderall (mixed amphetamine/dextroamphetamine salts), which are drugs that can regulate mood and behavior.

The antidrug campaign of the 1980s taught students to "just say no" to illegal drugs (especially alcohol, marijuana, cocaine, and crack). At the same time, record numbers of students diagnosed with ADHD were also prescribed psychotropic drugs to treat their symptoms. ADHD cannot be reliably diagnosed using objective standards of measurements such as brain scans, genetic tests, or testing for hormone deficiencies. There are no drugs to treat the cause of the disorder because scientists have not yet identified any biological causes. Therefore, ADHD medications can only treat behavior symptoms (not the cause of those symptoms).

During the same time that students were told not to take drugs for recreational purposes, a large percentage of them were nevertheless being prescribed drugs to treat behavioral conditions. In the late 1990s and early 2000s, there was less opposition to using marijuana as a potential remedy for mood and anxiety issues. Even if no medical authority proscribes such drugs, the generations growing up in the 1980s and 1990s were more comfortable looking for drug treatments to solve social or interpersonal issues. In 2016, a national survey indicated between 60% and 73% of antidepressants and other drugs (including marijuana) were prescribed without a psychiatric diagnosis. In many cases, marijuana is self-prescribed to treat perceived conditions.

Steroids

While psychotropic drugs were being developing during the 1950s, other scientists were also isolating drugs that could potentially enhance physical and athletic performance. Anabolic steroids are hormones the body uses to grow tissues and create muscles. The most familiar steroid is testosterone, which (when combined with physical exercise) can increase muscle mass in specific areas on the body.

Testosterone was first successfully isolated and replicated in a lab during the late 1950s, but rumors spread that communist nations had been secretly giving some sort of artificial performance-enhancing drugs (PEDs) to their Olympic athletes as early as 1952. Using artificial drugs to compete in sports is mostly viewed as unfair. Since then, professional and amateur sports associations have been struggling with how to recognize, regulate, and enforce prohibitions against PEDs by competing athletes.

Some very famous sports figures were implicated in steroid-use scandals, including Sammy Sosa and Mark McGwire who competed for top home-run records in a single season in 1997 and 1998 and were later exposed as having used steroids to reach their records. Ben Johnson and Marion Jones both won Olympic track-and-field medals, which were later forfeited due to steroid abuse. Perhaps most famous was the seven-time winner of the Tour de France cycling race, Lance Armstrong, who lost all his records and $75 million in endorsement deals after admitting to using PEDs for every race.

The unfortunate examples of these and other famous sports figures have not reduced the amount of drug use among professional and amateur athletes. A 2015 survey reported that as many as three million athletes have used PEDs and 10 times as many high school athletes admitted to using steroids in the 2010s as in the 1990s. Many athletes fear that if they do not take PEDs, they face an unfair disadvantage against the athletes who do. More than 60% of athletes believe that PED use should be a personal decision of the user. Fans of professional sports may be concerned about the legitimacy of new world-record holders, but at the same time, they also want to see faster, stronger, and more effective athletes on the field.

The prevalence of PEDs even among high school students has in some ways normalized the idea of using drugs to solve social problems. Amateur and professional athletics associations continue to struggle with regulating drug use, but in noncompetitive fields, the use of drugs for recreational purposes has generally become more common.

Cosmetics and antiaging

In addition to competitive athletes, the film and entertainment sectors also routinely use steroids and other PEDs for cosmetic purposes, so they can look stronger on screen. In addition to the chemical enhancements, modern digital technology also allows actors to look younger and more physically perfect on screen, in ways that are often impossible to achieve in real life.

Famous actors use drugs to appear more attractive and, therefore, more likely to receive higher-paying acting jobs in film. Unfortunately, millions of these actors' fans, while never acting in films themselves, often imitate their favorite celebrities' practices, including their PED use. The explosion of social media avenues during the 2010s created entire industries that manipulate and customize publicly displayed images so that anyone can appear to be something they are not in real life. It is not uncommon for people of all ages to invest money and other resources into plastic surgery, PEDs, and other treatments to make their real-life bodies appear as close as possible to the virtual images posted in social media.

The social pressure to appear young and beautiful also fueled a growing industry into antiaging drugs and practices. Since the 2000s, billions of dollars have been invested each year in new research aimed at potentially treating death and aging as if they were diseases that could be cured through medical treatment. The effort to find biological solutions is matched by a continuing effort to mask age and physical deficiencies through cosmetics and digital enhancement. Each of the industries reflects certain cultural priorities that promote health, happiness, and well-being through the recreational use of drugs and technologies.

Antiaging technologies cannot stop aging, and there is no treatment for death. Cosmetic enhancement through PEDs, surgery, or digital reconstruction does not change the nature and character of the person underneath. Yet many people spend much time and money in pursuit of quick solutions that would otherwise take time, genetics, and physical habits to achieve (if they could ever be achieved). These cosmetic priorities naturally influence (and are influenced by) public views on marijuana use.

Conclusion

Our modern world is filled with an almost endless array of distractions, from digital technologies to recreational drug use. Most social interactions are filtered through the lens of technology. Around 85% of Americans report being online every day, and nearly a third of adults report being online "almost constantly." Only 7% of the American population is never online. In the 2020s, most people interact with their friends and colleagues over some form of digital medium. It is not surprising that the greatest shift in cultural values with regard to recreational drug use occurred between 2005 and 2020, which is right around the same time as the technological revolution in social media, handheld computing devices, and the emergence of massively multiplayer online gaming environments.

There is a relationship between the growing and increasing presence of artificial digital media and the constant pursuit of distraction and avoidance in real-life interactions. In 2019, technology firms reported that 90% of Americans avoid direct phone calls and prefer to use asynchronous forms of communication (texting, email, etc.) rather than communicate directly or face-to-face. If recreational drug use is engaged in as a way to avoid difficult daily stressors, then marijuana can seem very normal if we develop other habits of social interaction that are also filtered through digitally enhanced tools. There are fewer opportunities in the modern world to experience the world directly, without any technological or medical aids at all. For some people, it may seem normal to use drugs to manage their mood and attitudes, rather than rely on traditional problem-solving skills based on interpersonal communication and relationships.

Marijuana has not caused these social changes. The movements to legalize *Cannabis* for medical use and recreational use did not cause the increasingly busy world. Nor would it be accurate to say that the busy world is solely responsible for the increased willingness to take marijuana. Nevertheless, there is a strong correlation between the two cultural shifts.

Case Studies

1. MARYCLAIRE'S VAPING OVERDOSE

MaryClaire is 16 years old and attends a public high school in a small farming community of about 5,000 people. Her parents are college educated and were born in the area. They both have good jobs that pay middle-income salaries, and MaryClaire lives in a comfortable home. MaryClaire has two older brothers who are one grade apart. Her brothers are very close, and after graduating high school, they went to the same university in the state's capital city. MaryClaire sees her brothers from time to time and hears their stories about quirky professors, difficult assignments, and many weekend parties with their friends. They do not tell her all the details of what happens at these parties, but they do share stories about drinking and the stupid stunts their friends play when they become drunk. Despite hearing about these stories, she does not really know what the "college parties" are actually like. She suspects there may also be some mild drug use and casual sexual relationships, but her brothers would never tell her about those details of their college lives.

MaryClaire is not an honor student, but she earns fairly good grades and has a few friends whom she hangs around with, though no one whom she is really close to. She does not feel that she is very popular and often feels insecure about the way she looks and the way she speaks and acts in front of other people. She has a lot of contacts on her social media accounts, and these contacts frequently share pictures and videos of

exciting activities and interactions with other people. She often feels left out and thinks that nothing in her life compares to the posts she sees. She often wishes she was included more.

MaryClaire has never been to a high school party with drinking and has never taken any drugs before, but she is not unaware of the party scene. She has a smartphone and spends much time on gaming sites. She does not really play the games, but she loves chatting with other players. She uses a fake name when chatting in these online spaces, which makes her feel more anonymous and safe. MaryClaire sometimes spends hours chatting and swapping memes, videos, and pictures. Sometimes people send her sexual messages and talk about parties or drug use or other activities that she has never participated in real life. Mostly, she ignores those messages, but occasionally, she pretends she is someone else and talks about things that she imagines other people are doing—like what she thinks her brothers may be doing or what she may have seen other people do on the internet but has never done herself. Even though MaryClaire has never actually met with her online chat friends, she often feels closer to them than she does to the people she goes to school with and sees every day.

During her high school junior year, MaryClaire was asked out to the Home Coming Dance by a boy she barely knew, but who hung out with a more popular crowd. She was excited because this was the sort of thing she used to pretend to do when chatting with her online friends. After spending weeks getting ready, she was picked up by her date and driven to the dance. She quickly found herself among a dozen other teens she had never met and who were from a nearby school. She tried to act like everyone else, but the other girls were clearly more experienced. At one point, she and the other girls went into the school bathroom together, and one of them took out her water bottle and informed MaryClaire it was actually filled with alcohol. Another girl pulled out an e-cigarette and offered it to MaryClaire. MaryClaire hesitated, but the other girls laughed at her saying that it was only marijuana and that it would only make her "loosen up" and laugh a little more. MaryClaire did not want to appear to be too afraid to try new things, so she accepted, thinking that marijuana was less dangerous than alcohol.

MaryClaire took her first draw from the vaping pen and starting coughing. Her friends laughed at her for being so innocent, so she took another draw even though she already felt dizzy. She felt her heart begin to race almost immediately, and she felt confused. Within a half hour, she began to feel sick to her stomach; she grew paranoid that her friends had tricked her into taking poison and fell into a panic attack. She also started

vomiting uncontrollably, fell down on the floor, and thrashed around with convulsions. Her friends alerted the school chaperone, and an ambulance was called. MaryClaire did not know that she had taken a very concentrated form of THC, and she accidentally overdosed. She spent several days in the hospital, the police investigated the incident, and her parents were called to attend her. She eventually returned home and recovered from her physical symptoms, but she was suspended from school, and the psychological trauma caused her to withdraw even more from real-life interactions with others.

Analysis

MaryClaire is not rich, nor is she poor. Marijuana users may be found in any social class and community setting. They are not limited to any racial, regional, or demographic group. MaryClaire did not intend to take marijuana at the dance but did so in response to pressure from her friends. Peer pressure is the most common reason why high school teens try marijuana for the first time, though family influence (parents and siblings) also play a major role in a teen's first use. Her suspicions about the college parties her brothers attended likely reassured MaryClaire that drinking and vaping were normal social activities. MaryClaire has very little actual experience with parties or with direct socialization with friends in any situation, but she is heavily influenced by expectations she learned from her social media outlets. She knows that she is inexperienced, but she believes that participating in the sorts of social activities that other people talk about will make her less nervous. Family experiences, combined with her personal insecurities, make MaryClaire more vulnerable to pressure from her friends. The final factor in her decision-making was MaryClaire's belief that marijuana is safer than smoking and drinking and that vaping is safer than smoking marijuana. In fact, marijuana is just as risky as binge drinking, and vaping is more dangerous than smoking because the THC-extract dose is unpredictable. Like many people, MaryClaire's reaction to marijuana was unexpected. She fell into a panic because she did not expect the rapid heart rate, dizziness, or general sense of confusion. Vaping pens more easily lead to overdoses due to their potential for very high concentrations of THC. Vomiting and convulsions are common side effects of overdosing. MaryClaire faces school suspension even though marijuana is legal in Oregon because recreational marijuana is not legal for teen use in any state, and most school districts will suspend students for illicit vaping at school events.

2. ALEX'S USE OF MEDICAL MARIJUANA

Alex is 56 years old and was diagnosed with stage IIA Hodgkin's lymphoma disease, which is a cancer that is most commonly treated through chemotherapy and has a high recovery rate. He was scheduled for six rounds of chemotherapy over the span of 12 weeks. Alex did not feel many side effects from his cancer, but the chemotherapy treatments were very difficult for him. He lost his hair 10 days after the first round, but the most troubling symptoms were related to the intense nausea that he experienced during the first two or three days after treatment. He also noticed he was easily bruised, his mouth developed sores, and he felt more aches and pains during routine activities and was more easily tired. These symptoms combined together made Alex less interested in eating food, and he began to lose weight. The doctor warned him that the side effects of chemotherapy built up over time and that they would likely get worse as the treatment cycle progressed.

The doctor prescribed a medicine that was supposed to help with his nausea, but Alex did not feel that it was working. He talked to friends and searched online to find out if there were other supplemental treatments that he could take to better manage his symptoms from the chemotherapy. Alex lived in California, and the most frequently cited remedy was marijuana. Dozens of online websites he visited claimed that marijuana would encourage his appetite and provide relief for the aches and pains. Some websites claimed it could help with nausea and might even help fight the cancer itself. Marijuana is legal in his state and could be taken with or without a prescription.

Alex's oncologists (the cancer doctor) did not recommend he take marijuana because they feared it would complicate his respiratory and immune system during treatments. They assured him that it would not help fight the cancer directly, but they admitted it could help increase his appetite after his treatments. They recommended other drugs that he could try, but Alex smoked marijuana as a teenager and felt more comfortable taking that option rather than experimenting with some other drug that he had no experience with. The doctor signed the prescription for a marijuana card after Alex indicated he was willing to accept the potential risks. Marijuana is not covered by his insurance, and though medical marijuana is less expensive than the other legal varieties he could find at the local shops in his town, the variety of options was also more limited. His friends suggested he just buy from a private dealer, but Alex purchased from a legal medical dispensary because it was cheaper than the other legal recreational marijuana shops and more reliable than the

private (illegal) dealers. He eventually purchased a variety of marijuana that was higher in CBD and slightly lower in THC.

Since Alex had taken marijuana before, he experienced no surprises when he smoked it after his second round of treatments. The marijuana did not make him any less nauseous, but it did help pass the time during the first two or three days after his treatment, and he felt more at ease. His mouth sores were unaffected, and in fact, the smoking seemed to irritate his mouth. He also seemed to feel even more tired than usual. He slept a lot more, so he did not notice that he was still not eating very much. While he was awake, Alex was able to take small snacks about an hour after taking the marijuana, but his stomach was still very sensitive, and he mostly chose to fall back asleep. By the third day after treatment, he began to feel better and did not seem to need the marijuana to encourage his appetite.

Alex reported his reactions to the oncologist before his third treatment. The doctor asked if he thought the marijuana was helping or hurting or had little effect either way. Alex said that he had been expecting the marijuana to be more pleasant, because he always remembered taking it with friends at parties when he was younger. The experience was much more different when he was taking it alone and already feeling sick. In some ways the marijuana seemed to help dull the general experience, but in other ways, he felt that it was just another drug that made him feel confused and sleepy. He was not sure if it was being helpful or not.

Alex tried the marijuana again after his third treatment, and the results were mostly the same. The main difference was that his nausea seemed to have gotten a little worse, but he could not tell if that was from the chemotherapy or from the marijuana. He liked that the marijuana seemed to make him want to sleep more but also felt his sleep was less restful. Alex wondered if he would be just as likely to sleep from the effects of the chemotherapy drugs alone. He spoke to his oncologist and was told that the marijuana did not appear to be hurting his cancer treatment, but it was also not going to help. The marijuana would only treat the symptoms from the chemotherapy. Alex had to decide if the positive benefits outweighed the side effects. In the end, he decided to stop using the marijuana for his last few treatments because it seemed to add to his sense of feeling overly drugged.

Analysis

Alex may appear to be a prime candidate for a prescription of medical marijuana. The 2017 report of the National Academies of Science,

Engineering, and Medicine indicated there was limited evidence to support the use of marijuana to encourage appetites for patients suffering from weight loss following chemotherapy treatments. The report cited "limited evidence," but since online websites are not regulated by any reliable authority, they often make claims about benefits that have not been proven by any reputable scientific study. Marijuana does not treat any disease, but it might encourage appetites for certain people. Alex's decision to take medical marijuana is not unreasonable, but online reports increased his expectations for a successful remedy. States may legalize the use of marijuana for medical and/or recreational use, but it is still prohibited at the federal level. For that reason and because the FDA has not recognized that marijuana can safely and effectively treat any disease, insurance companies will not pay for medical marijuana. Regulation costs, quality assurance tests, and taxes make recreational marijuana more expensive than medical marijuana (which has a lower tax rate), but legal marijuana is almost always more expensive than illegal marijuana sold through illegal vendors who do not pay taxes or licensing fees. The specific effects of marijuana are largely determined by expectations and surrounding environment. Marijuana may sometimes increase patients' appetites, but individual reactions vary from patient to patient. The effects of chemotherapy will often overwhelm the effects of marijuana, so patients are not guaranteed to feel noticeable relief, though they may feel increased cognitive issues like confusion and paranoia. Cancer patients who were regularly taking marijuana prior to their diagnosis, will often continue to take marijuana as a supplemental treatment during their chemotherapy. Patients who are not already used to regularly smoking marijuana may try the drug for potential relief, but they often discontinue use as chemotherapy treatments progress because marijuana can increase mental confusion and become an added source of anxiety.

3. EMILY ACCIDENTALLY DRIVES UNDER THE INFLUENCE

Emily is 22 years old and lives in Oregon where marijuana is legal for both medical and recreational use. She began taking marijuana while in high school, though she does not consider herself a heavy user. She does not smoke cigarettes, but she will drink alcohol with her friends on weekends, and she will often take marijuana if it is available, but she does not often seek it out. She prefers to eat brownies that have been baked with marijuana, and if she is at a party and has already had a few drinks, then she

rarely says no if marijuana brownies are offered to her. She estimates that she takes marijuana only once or twice a month, and sometimes she can go several months without having any at all.

Emily is very careful not to drive after drinking. She has a small frame of just over five feet tall and weighs about 110 pounds. She knows that one drink will usually make her feel warm, and two drinks will make her feel a little buzzed. If she drinks more than two drinks, then she waits at least an hour per drink before she gets behind the wheel. Emily is very concerned about getting pulled over by the police, and she does not want to hurt anyone by drunk driving.

On one night at a party, Emily consumed two drinks in an hour, and then someone brought out marijuana brownies. These were purchased at a local marijuana shop, and she had not tried them before. She ate one brownie over the course of about five minutes and felt no effects, and absent-mindedly, she ate another. She was still feeling some of the warmth from the alcohol, and as the party progressed, she forgot about the brownies and stopped drinking completely. She was planning on leaving the party early. About an hour later, she felt like the effects of the alcohol had worn off and she still did not yet notice any effects from the brownies, so she decided to leave the party and drive home for the evening.

On her way home, Emily began to feel a growing sense of relaxation and euphoria, and she realized that the brownies were beginning to take effect. She was used to taking marijuana, so she did not feel impaired or dizzy. She thought she would be fine if she continued driving as long as she was careful. About 30 minutes later, Emily felt very relaxed and noticed that she was nearing home much sooner than expected. There was a green light ahead that had just turned yellow. She thought she was safe, so she put her foot on the accelerator in order to make the light before it turned completely red. As she passed through the intersection, a car from across seemed to have sped up and passed right in front of her. She heard a loud crashing sound, saw the hood of her car crumple under the impact, and felt the airbag deploy in her face. She lost track of what she could see but felt the car spin around the intersection once or twice. She seemed to have been driving faster than she thought, and when her car finally came to a rest, Emily could see that the other car was deeply crushed on the passenger side. She looked around her own car and realized her windshield was cracked and folded and her legs were trapped behind the dashboard. She could not feel her feet, but she could move her fingers. She lost consciousness before the police and ambulance arrived.

Emily woke up in the hospital with doctors by her bed. They told her that she was in an accident, though at the time, she could not remember

what had happened. Her legs were in casts, and her right arm was in a sling. She drifted in and out of sleep but eventually awoke with a police officer next to her bed. They informed her that though her blood alcohol level was below legal intoxication, her THC levels were higher than legally permissible. Because she was involved in an accident, they extracted a blood sample and tested for other drugs. They estimated that her THC levels at the time of the accident were much higher than what they were at the time of the blood test. Nevertheless, she was still cited for driving under the influence.

Analysis

Alcohol affects people differently depending on their size and weight, but it usually leaves the bloodstream at a regular rate. Marijuana also affects people differently but is not always related to size and weight. Habitual use, even if only once or twice a month, may result in users feeling they are in more control of their motor functions and reaction times than they actually are. The combination of alcohol and marijuana usually compounds the effects of impairment. If the marijuana user already has THC stored in their fat cells, then they may not always notice the effects of marijuana even if they do notice the effects of alcohol beginning to wear off. Edible forms of marijuana take longer to take effect, and depending on how often the user consumes the drug, the effects may not be immediately noticeable until up to 60–90 minutes. Marijuana brownies come in a wide variety of doses depending on the amount and potency of the THC concentrate used in the baking. Some brownies may end up being much more potent than others. People who drive under the influence of marijuana often feel more confident than they would be if they were driving drunk. Yet the marijuana typically increases their willingness to take risky chances. Impaired drivers are twice as likely to be in an accident than drivers who have not taken alcohol or other drugs. THC dissipates quickly in air passages, and the levels of intoxication are best measured through blood samples immediately following an accident. Those levels can decline quickly if more than an hour has passed between an accident and the blood extraction. Most states will automatically take a blood sample if there is an accident that appears to involve some intoxication. The admissibility of the evidence depends on the circumstances and the amount of probable cause given for testing the blood. More often than not, the blood samples are admitted into evidence, and the driver is convicted based on that evidence.

4. CHARLES IS SELF-MEDICATING

Charles is a 37-year-old professional photographer who is moderately successful. His work is well received, but he often finds the job stressful because he feels uncomfortable in the social settings where he most often works—like wedding parties and other large public gatherings. He also worries that he may not be creative enough to satisfy his clients and sometimes turns clients away because he does not want to become overwhelmed by the increasing expectations. Charles's mother took medications to manage bouts of depression for much of her life, but he has never been formally diagnosed with her disorder. He began seeing a therapist when he was in his early twenties because he feels lonely from time to time, and he finds it helpful to talk to someone. He has never developed a successful long-term relationship with a partner, but he believes it is because he has not met the right person. For the most part, Charles feels he is in control of his life.

Charles has smoked marijuana for most of his adult life. He started as a senior in high school as a way to celebrate with friends. At that time, he only smoked occasionally because he thought marijuana helped to loosen him up to become more sociable. After high school, when he started working professionally, Charles began smoking marijuana more often as a way of relaxing after stressful events. He does not like tobacco or cigarettes and feels they are more dangerous than marijuana. He also drinks infrequently. He is uncomfortable in bars and nightclubs, and he believes that alcohol makes him feel more depressed. He usually smokes marijuana at home by himself because he feels it helps improve his mood even when he is alone. Charles asked his therapist to sign off on a marijuana card as soon as it was legalized for medical use. He did not really believe he needed it as a medical treatment, but he wanted to have the opportunity to buy marijuana legally without fear of legal trouble.

As a rule, Charles does not smoke before his photo sessions, but he often does so afterward. He has developed a routine, which includes smoking almost every day. Charles does not feel he has a drug problem because his smoking does not interfere with his job, nor does it seem to worry his friends. He has never tried to quit because he believes marijuana helps him to cope with daily stress, and it keeps him from falling into more serious anxiety disorders like his mother experienced.

When Colorado legalized marijuana for recreational use, Charles did not initially change his smoking habits. Within a few months, though, he found out that there were many more options in recreational marijuana shops, even though the price was less expensive in the medical

dispensaries. He stopped using his marijuana card and began experimenting with the different recreational varieties. Smoking marijuana became a sort of a hobby for Charles, and he thinks of himself as someone with special expertise on the subject. He spends much time on websites reading news and opinion pieces on the latest trends, and he frequently posts comments. He has experimented with a variety of THC forms, including vaping, edibles, and tinctures, but he always returns to his daily routine of smoking marijuana.

Charles did not believe he was smoking more marijuana than he did before his state legalized recreational use, but he does notice that he is smoking more intense varieties. He is aware that he has developed a greater tolerance for stronger doses, but he feels like he has strategies for managing the effects. He alternates between stronger and weaker blends, but Charles rarely interrupts his daily smoking routine. Since full legalization, he also no longer feels embarrassed to talk about his hobby. He feels certain that most of his friends also take marijuana in some form from time to time, even if they do not talk about it. Charles still meets with a therapist because he continues to experience stress from his job, and he still feels lonely and insecure in his personal relationships, just as he always had. Since full legalization, though, he no longer views his marijuana use as part of a treatment plan. He believes it helps keep his daily anxiety under control, but he does not feel he is taking marijuana because he needs it. Instead, Charles feels it has become part of his preferred lifestyle, similar to the way his therapy and his job have become normal parts of his weekly routine.

Though Charles does not feel stigma from either the therapy or the marijuana use, he frequently worries that the marijuana laws of his state may change. He follows the national news and is very concerned about political trends that seem to target his smoking. He does not understand why more people do not support marijuana use, and he often feels that people are actively trying to prevent him from enjoying his lifestyle. He will turn down photo shoots if he thinks the client opposes marijuana legalization. He is very active online promoting marijuana as an alternative lifestyle choice. Charles has no plans to change his routine.

Analysis

The probability of developing anxiety disorders may be influenced by family history, but the diagnosis of a parent does not mean the children will suffer from the same conditions. Common situations of stress caused by work or personal relationships do not necessarily imply an anxiety

disorder. When states began legalizing marijuana for medical use, many users who obtained a marijuana card did so for recreational purposes, not always for medical purposes. Most marijuana users do not believe they have a problem and are often convinced marijuana helps them even if others can see dependency. Legalization of recreational marijuana usually leads to an increase of use among nonusers but may not always increase the frequency of use among habitual users. In either case, the increased market competition often leads to more potent varieties of *Cannabis*. Habitual marijuana users can learn to adapt to the effects of the drug, so they can consume it frequently without it interfering with their daily routines. Tolerance and coping skills can lessen the perceived effects of the drug on the user. The hallucinogenic effects of marijuana often lead to delusions of grandeur, where the user believes they are gifted with special wisdom and knowledge that nonusers do not know. Marijuana usually increases anxiety issues, but users tend to blame other causes. Marijuana also increases feelings of paranoia and persecution, causing users to fear that other people are attacking them in some way.

5. AUGUST'S CONTAMINATED CBD

August is a 19-year-old barista who lives in New York City. She moved out of her parents' home a year earlier to share an apartment with four of her friends from high school. She and her friends wanted to experience the city life before they decided on which direction they wanted to go with their futures. Her family gave her some money to start with, and they pay for her phone, but she mostly takes care of herself and her own bills. She earns enough tips to pay her way for most activities, but she never has much extra money to spend.

August does not think of herself as a marijuana user, though she usually vapes THC about once or twice a week. She mostly puts nicotine in her vaping pen, and since she cannot vape while she works, she usually only takes it out with friends in the evening. Mostly, August thinks of herself as being open to new experiences. She does not consider THC a serious drug. She frequently talks about her future plans for school and considers her year in New York City as part of her extended education in the real world. She and her friends have no intention of living there forever.

August is very active in social media, and when she is not working, she likes to go to dance clubs once or twice a week. Since she is under 21, she is limited to certain nights at legal bars and concert halls, but she has experimented with a few illegal dance parties (raves) that she heard about online. She just wanted to see what they were like. They were a

little too crowded for her, and she did not feel safe. She and her friends prefer the legal music venues that cater to under-21 crowds. August has access to alcohol because people will offer to buy her drinks, but she generally avoids drinking or getting drunk because she is afraid the alcohol will slow her down. She mostly wants to experience the excitement of the nights. She and her friends will occasionally take other drugs, and she frequently vapes nicotine, CBD, and sometimes, THC. She owns a couple of vaping pens in different colors, and she treats them as a fashion accessory. August has taken Ritalin and ecstasy (or Molly) a few times, but she tries to stay away from what she thinks are the more dangerous drugs like methamphetamines, LSD, and cocaine. She just wants to enjoy the music scene and does not want to become a drug addict. If she takes ecstasy, it is because one of her friends gave her a pill at some point during the night. She does not hang around with drug dealers, and she has never paid for those drugs directly.

Recreational marijuana was illegal in New York when she arrived, but August knows that the police are only concerned about the other drugs. She buys her nicotine pods for her vape pen at a local grocery store, and she buys flavored CBD vape juice from a vape shop down the street. She alternates between CBD and nicotine so that she does not become overly dependent on the nicotine pods. Vaping products are legal in New York for anyone 18 years or older, but August heard that the state may legalize recreational marijuana, which could mean they might also raise the buying age for CBD and other vaping products up to 21. She likes vaping the CBD and believes it helps her relax. She also likes the nicotine because it provides a quick lift. She treats it like a cup of coffee and uses the CBD as a sort of vitamin. She does not consider either of them to be dangerous, and she wants to ensure she continues to have access to both. She is very concerned that the government will make it harder for her to buy before she turns 21.

August searched online for websites that sold CBD, nicotine, and THC pods and mailed them directly to her door. She found many sites that describe their products, but she realized it was harder than she thought to buy directly online without a marijuana card or some other proof of her age. One of her friends told her about a guy who buys vaping pods and other marijuana products legally so that he can sell them to his friends who are too young to buy. He did not charge too much extra, and the friend thought he was a good guy. She offered to buy some for August the next time they met up. Since she found it hard to buy online, August gave money to her friend to buy some CBD juice and some THC pods for her vaping pens. She did not want to buy drugs, but she just wanted to try it out and see if she could continue to supply her vaping pens if the laws changed.

August's friend brought home a bottle of strawberry-flavored CBD juice, which said it was made from "100% Natural CBD Extracts." It was a brand that she had seen online and was advertised as providing a very light buzz but was lighter than traditional THC. She tried it out later that night. She did not expect to feel much, but this dose made her start coughing, and she felt dizzy and sick to her stomach. She fell to the floor and started convulsing. Her friends called 9-1-1, and she was rushed to the hospital. They gave the bottle of the vaping juice to the doctors to be tested, and they later found out that it was contaminated with a synthetic THC compound mixed with rat poison. August survived the episode, but she heard a news report that many other people had also taken the contaminated CBD oil and were also rushed to the hospital. Some of them did not survive.

Analysis

Most high school students do not believe that marijuana is a dangerous drug, and they believe vaping is safer than smoking. About 90% of youths aged 17–24 who participate in the urban dance club culture take drugs of some sort, and more than two-thirds take multiple drugs at once (polydrug use). Some of the most popular are ecstasy, methamphetamine, cocaine, and opioids. These are frequently mixed with THC to moderate the effects of the high. Most teens do not see themselves as drug users when they are only experimenting occasionally. Most drug users do not see themselves becoming addicted. Many states that legalize recreational use of marijuana often follow the legislation with more rigid controls over age requirements. The same states often add more restrictive controls on other legal products, especially tobacco, alcohol, and flavored vaping products. Online vendors are not regulated by the FDA, and though users can buy illegally, it is somewhat difficult and requires users to use special apps that are potential risky. Private sellers (illegal dealers) have no safeguards at all. They sell based on their reputations, but they may not always know what they are selling. Illegally purchased products are often counterfeited, which means sellers may use real bottles with real labels, but add other, cheaper ingredients. Some forms of CBD oils that are marketed online and are illegally sold through private vendors are intended to produce THC-like effects. They are often contaminated with synthetic THC or other drugs but still marketed as CBD. The CDC issued warnings about contaminated vaping products that sent hundreds of people to the emergency room.

Glossary

Addiction: Any dependency on substances or behaviors that is so strong that the affected individual is unable to stop using the substance, or engaging in the behavior, even when they know it is harmful to themselves or to others.

Amotivational Syndrome: A pattern of behaviors resulting from a general loss of motivation for initiating or completing tasks, even if those tasks are important to self, family, or other loved ones.

Amphetamines: A drug that stimulates the central nervous system, making the neural messages respond more quickly. Known as "speed" or "uppers," these drugs also stimulate dopamine, which makes them highly addictive. In its crystal form, they are known as methamphetamine ("Meth"). Amphetamines are listed as Schedule II drugs and are illegal without a prescription.

Anabolic Steroids: The group of hormones involved with reproduction that helps to build body tissues. The most popularly recognized anabolic steroid is testosterone, which can be synthesized and replicated in many forms to increase muscle mass. They can be psychologically addictive and are listed as Schedule III drugs and are illegal without a prescription.

Anxiety: A general fear or nervousness about future consequences.

Attention Deficit/Hyperactivity Disorder (ADHD): A sustained pattern of behaviors characterized by an inability to focus attention that is often combined with an inability to remain calm or to restrain actions (called impulsiveness). Originally identified as a childhood condition but is now also more common among adults.

Baby Boomer: The name given to the generation of Americans born after World War II, between 1945 and 1955. For many decades, baby boomers formed the largest single age group in the American population.

Binge Drinking: Drinking alcohol quickly enough to induce a blood alcohol concentration to the point of legal intoxication (0.08). For normal-weight males, this usually involves drinking two to three drinks per hour (less is required for normal-weight females).

Bipolar Disorder: A psychological disorder characterized by unusual swings in mood, energy, and motivation levels. Also known as manic-depressive illness, bipolar disorder is identified by patterns of behavior that alternate between high energy (mania) and low points (depression).

Blackout: A condition that may follow extensive alcohol or drug use, when the user may not remember long periods of time during their intoxication, despite being awake and active.

Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF): An agency with the U.S. Department of Justice (DOJ) responsible for enforcing the laws regulating the distribution, sales, and manufacture of alcohol, tobacco, and firearms, including explosives.

Cannabidiol (CBD): One of the chemical compounds found in *Cannabis* plants that does not produce intoxicating or mind-altering effects. Typically found mostly in hemp varieties, CBD has recently become popular as a potential medical ingredient due to its association with marijuana.

Cannabinoid Hyperemesis Syndrome: One of the symptoms that occur after marijuana overdosing, which involves frequent and severe

vomiting. The condition was relatively unknown prior to the development of THC concentrates. The popularity of vaping and high-concentration marijuana edibles has made the condition one of the more common reasons for marijuana-related emergency room visits since the early 2000s.

***Cannabis*-Friendly:** An adjective to describe doctors who are willing to prescribe marijuana as a medical treatment, even when they suspect it may be mostly used for recreational purposes.

***Cannabis Indica* (or *C. Indica*):** A variety of the *Cannabis* plant that is short with more green leaves and flowers, which originated from Central Asia. It includes high levels of both THC and CBD in a more equal ratio. Most modern *Cannabis* plants have been interbred to combine multiple varieties.

***Cannabis Sativa* (or *C. Sativa*):** A variety of the *Cannabis* plant that is taller with thinner leaves, which originated from Eastern Asia. It includes higher levels of THC and lower levels of CBD in an unequal ratio. Most modern *Cannabis* plants have been interbred to combine multiple varieties.

Cannabis Use Disorder: Another way of describing marijuana addiction. Marijuana is not physically addictive, but it can be highly addictive psychologically, which means users may be unable to stop using even when it becomes harmful to self and others. Physical characteristics of Cannabis use disorder include problems with memory, attention, and diminished learning capacity.

Carcinogens: Any substance that is believed to lead to cancer. Scientists do not know with certainty that anything is always carcinogenic. Instead, they identify strong correlations with certain substances and higher than normal frequency of certain cancers in people who were exposed to those substances.

CB1 and CB2 Receptors: Neural receptors that are naturally shaped to respond to cannabinoid compounds found in marijuana and CBD products. CB1 receptors are mostly found in the brain, and they respond most to THC compounds, resulting in the intoxicating and mind-altering effects of the drug. CB2 receptors may be found throughout

the nervous system, and they appear to balance out the effects of CB1 stimulation. They are most responsive to CBD compounds. Scientists do not know the exact functions of either receptor.

Cell Receptor: A protein located on cell membranes that allows certain compounds to enter the cell and activate certain functions. The shape of each cell receptor determines which chemical compounds are allowed into the cell.

Centers for Disease Control and Prevention (CDC): The government agency within the U.S. Department of Health and Human Services that is responsible for tracking health statistics and making recommendations for protecting the public health.

Central Nervous System: That part of the human body that includes the brain and the spinal cord. It is the primary means by which the brain communicates with the various organs, muscles, and tissues of the body.

Cognitive Behavioral Therapy: A therapeutic treatment plan that focuses on teaching users to better control their urges and avoid behaviors that can lead to addiction.

Commission on Narcotic and Drug Abuse (1963): A presidential commission that marked a shift in drug enforcement policies by placing more attention on the treatment and rehabilitation of users and less emphasis on the prosecution of users (through jail terms).

Controlled Substances Act(1970): A federal law that classified all drugs into five categories based on the potential for abuse, their potential for medical usefulness, and the extent of practices that guarantee safe use and distribution of the drug. This law marks a turning point in drug enforcement policy because it combined all the previous rules and regulations related to legal and illegal drugs into a single enforcement system.

Convergent Thinking: The ability to sort through many different options and arrive at a single solution to a problem.

Culture War: The nonviolent conflict between at least two distinct worldviews on matters related to morality, politics, and faith. Political

parties can separate groups over matters of economics and political priorities, but a culture war involves larger distinctions that may cross party lines and often include core differences on matters related to the meaning of life, virtue, and moral order.

Dabs: Concentrated forms of THC extracted from the *Cannabis* plant and used in vaping machines or in edible products (like baked goods or candies). Some dabs may have concentrations of THC very close to 100%. High concentrations of THC are the most frequent cause for marijuana-related emergency room visits.

Delusions of Grandeur: A delusion is a false belief that is not supported by obvious evidence or rational explanation. A delusion of grandeur is the false belief that one is superior to those around them in intelligence, cleverness, wisdom, and power. It is a form of hallucination that is common with marijuana use and may stay in place even after other intoxicating effects have faded away.

Dependency: When related to drug use or other behaviors, a dependency refers to the inability for someone to live their lives without using the drug or engaging in the behavior without great discomfort.

Detox Programs: An addiction treatment program that separates the user from the source of their addiction long enough that the substances (or behavioral urges) are removed from their system. These treatment programs allow users to develop new habits without the use of the drug or other destructive behaviors.

Divergent Thinking: The ability to consider multiple options to solve a problem without concern for a single ultimate solution. Divergent thinking requires convergent thinking to ensure effective problem-solving.

Dopamine: A type of neurotransmitter that communicates sensations of pleasure and satisfaction to the brain. It is part of the reward system in our brain that influences what we like, what we want to do, and how we learn. It plays an important role in human motivation.

Dravet Syndrome: A very rare and severe form of epilepsy that afflicts very young children. Dravet syndrome is the only condition for which the FDA has approved the therapeutic use of CBD as treatment.

Dronabinal: A synthetic form of THC that has been approved by the FDA to encourage appetites in patients suffering from extreme weight loss due to physical causes. It comes in the form of a capsule and lasts about three to four hours. It is a Schedule II drug that is illegal to take without a prescription.

Drug Abuse: Any use of any drug to the extent that it harms the self or others.

Drug Enforcement Agency (DEA): The government agency within the U.S. Department of Justice (DOJ) that is responsible for policing and enforcing the regulations controlling the illegal use and distribution of controlled substances as defined by the Controlled Substances Act (1970).

Drug Trafficker: Someone who engages in illegal drug trade and/or who transports (potentially legal) drugs over state lines where they may be illegal.

Drunk: A term used to describe the condition of being intoxicated by alcohol.

E-cigarettes: Electronic devices that raise the temperature of a substance (called a dab) to the point above evaporation but below the point where paper burns. These devices "vaporize" the substance without burning them and are used for "vaping." E-cigarettes may be used for nicotine products or for THC or other drugs. E-cigarettes are one of the most common causes of marijuana overdosing.

Ecstasy (MDMA): A form of methamphetamine taken as a pill or in liquid form that alters mood and perception as a mild hallucinogen. Also known as "molly," it is often associated with parties and dance clubs. It is frequently used with other drugs, including marijuana, and is often contaminated with other drugs such as cocaine and heroin, and overdosing may be fatal. Ecstasy is a Schedule I drug and is illegal to use without a prescription.

Edibles: Refers to any food or drink that includes THC. Edibles may include baked goods, candies (like gummies), or drinks. Edibles often contain very high concentrations of THC and are one of the leading causes of marijuana overdosing.

Endocannabinoid System: The set of neurotransmitters and receptors within the central nervous system that appear to maintain chemical homeostasis within the body in reaction to changes in the physical environment. This system responds to THC and triggers dopamine reactions as well as many other reactions that are not entirely known or understood by scientists.

Endorphin: A type of hormone that is released in response to pain or physical stress. They provide temporary pain relief and encourage a feeling of well-being. Drugs that artificially trigger the release of endorphins (such as opioids) can be highly addictive and often lead to fatal overdoses.

Epidiolex: The brand name of an FDA-approved form of CBD extract used to treat Dravet syndrome.

Euphoria: An emotional reaction marked by a sense of great happiness or an exhilarated sense of well-being. Usually used to describe artificial drug-induced conditions.

Executive Functions: The highest level of brain functions that include the ability to make decisions, the use of short-term (working) memory, and learning. Executive functions involve free will and choices deliberately made by the individual. Impairment of the executive functions results in a limited ability to control decisions, make judgments, or learn.

Federal Bureau of Narcotics: Created in 1930 as an agency within the U.S. Treasury Department, the Narcotics Bureau was responsible for enforcing federal drug laws. The agency was moved over to the Department of Justice (DOJ) and renamed the Drug Enforcement Agency after the passage of the Controlled Substances Act of 1970.

Feedback Loop: Refers to the way various organs communicate the results of biochemical reactions back to the source to ensure homeostasis (balance) within the body. Feedback loops tell the body when enough chemicals have been released and when more chemicals are needed. There are thousands of types of natural feedback loops within various systems of the body that ensure healthy management of our hormones and the nervous system.

Fetal Alcohol Syndrome (FAS): A condition brought about through exposure to alcohol while a baby is developing in the mother's womb. It is characterized by brain damage, learning difficulties, and problems with growth development. The defects caused by FAS cannot be reversed.

Flat Affect: Refers to the general lack of emotional response. Habitual marijuana use may produce flat affect, which means users show little or no emotion to events that ought to stimulate some response.

Food and Drug Administration (FDA): A U.S. agency responsible for protecting the public health by monitoring the safety and effectiveness of food, drugs, and medical products sold in the United States. The FDA is separate from the DEA in that it monitors safety but does not enforce the laws against illegal trade of controlled substances.

Gamma-Aminobutyric Acid (GABA): A neurotransmitter that inhibits certain actions within the central nervous system, including the release of dopamine. THC indirectly triggers the release of dopamine by limiting the release of GABA.

Gateway Drug: Any drug that may encourage users to engage in drug abuse because it appears to be less harmful than other more addictive or harmful drugs. Gateway drugs do not force users to take other drugs, but they can train users to become desensitized to the dangers of drug use. Marijuana is a gateway drug. Most users who are addicted to harder drugs began their drug use with marijuana, which they initially believed to be harmless.

Grower's License: Refers to the state tax required for *Cannabis* farmers to grow marijuana or hemp crops. Anyone who fails to obtain a grower's licenses is an illegal farmer, even if they operate in states where marijuana is legal.

Hallucinogenic: Any substance that produces artificial sensations that are not natural to their sensory organs. Hallucinations may include hearing voices that are not there, seeing colors or images that are not real, or believing ideas or fears that have no rational basis. Marijuana is a mild hallucinogenic that impacts the sense of time, visual perceptions, emotional feelings, and beliefs (including paranoia).

Hangover: A condition that follows intoxication from alcohol. Common symptoms include headaches, weakness, nausea, sensitivity to light and sound, and general aches.

Harrison Narcotics Act (1914): One of the first federal laws regulating the sale and transportation of drugs (initially, opium and cocaine) across state lines. The law was expanded many times over the course of the 20th century as new drugs were developed and introduced into American culture that threatened public health. The final comprehensive approach to federal drug enforcement occurred with the passage of the Controlled Substances Act of 1970.

Hashish: A form of marijuana that is processed in a way that concentrates the levels of THC into a thick waxy substance. Hashish was originally eaten, but later vaporized or smoked as new devices were invented. Hashish was the first attempt to isolate and concentrate the intoxicating elements of *Cannabis*. Its use was mostly limited to the Middle East until the early 20th century, when its use spread through trade routes around the world and into the United States.

Hemp: A variety of *Cannabis* used primarily for the production of textiles (cloth) and rope, with very long, woody stems. Grown mostly from *Cannabis sativa*, hemp played a significant role in European cloth manufacture for ships (canvas and ropes). Due to its low THC content, most hemp farmers were unaware of the drug potential of their crops.

Hemp Farming Act (2018): A federal law that legalized the production of hemp crops with THC content less than 0.3%. Modern hemp farmers grow it mostly for CBD extraction. The Hemp Farming Act passed Congress following the FDA approval of a purified form of CBD to treat Dravet syndrome.

Homeostasis: Refers to a state of balance within the human body, which keeps all internal systems within relatively constant levels despite changes introduced from outside the body. Homeostasis depends heavily on the many feedback loops within each system.

Ideology: A set of ideas or beliefs shared by a broad group of people. Ideologies may be based on political ideas, economic ideas, religious ideas, or any other ideas that people believe are important in their lives.

In-Patient Treatment: Refers generally to addiction treatment programs that require the patient to live in a facility away from home. Such programs usually involve direct medical supervision and include counseling options.

Isomer: Molecules that have the same atomic formula but have different shapes. It is the molecular shape that often determines the functions of a biochemical compound because the different shapes fit into different cell receptors.

Kief: Refers to the residue left over after marijuana buds have been sifted and processed. In the 1990s, marijuana growers began processing the kief to create additional THC extracts that were used for dabs and edibles.

Lysergic Acid Diethylamide (LSD): A hallucinogenic drug originally developed to treat schizophrenia. It was later used in the late 1950s as a recreational drug and spread through college campuses in the early 1960s resulting in its widespread criminalization within a few years. LSD frequently leads to permanent psychosis. Also known as "acid," LSD is a Schedule I drug and is illegal to use without a prescription.

Marihuana Tax Act (1937): The first federal law to explicitly regulate the manufacture and sale of marijuana. Previously, individual states along the Mexican border had prohibited marijuana sales as the problem of drug use became associated with crime in their states. The Bureau of Narcotics recommended a federal law after marijuana became more noticeably associated with crime in large cities during the 1930s.

Marijuana Card: Any state where marijuana for medical use is legal, requires a Marijuana Card that certifies that the user has a doctor's recommendation to use the drug. In states where recreational marijuana is legal, users may still require a Marijuana Card if they want to access state-approved medical marijuana dispensaries. Marijuana cards are taxed.

Marijuana-Induced Psychosis: Psychosis is a condition where the sufferer is disconnected from the real world through hallucinations and delusions and who often express themselves with disorganized speech or confused behaviors or by simply ceasing all communication entirely.

Outside observers are unable to rationally communicate with psychotic sufferers. Marijuana may induce psychosis in users already predisposed to mental illness. Marijuana use is involved in about half of all patients diagnosed with psychosis or schizophrenia.

Metabolism: Refers to the chemical processes occurring within the human body when food or other nutrients are broken down into their biochemical components to keep the organs and other bodily functions operating.

Misuse of Drugs Act (1971): The British equivalent of the Controlled Substances Act of 1970, which was also adopted by most British Commonwealth Nations. It creates a comprehensive schedule of drugs according to their susceptibility to abuse, their potential for medical use, and the existing practices in place to ensure safe distribution and use.

Nabilone: A synthetic form of THC that was approved by the FDA to treat the symptoms of nausea and vomiting associated with cancer treatments. It is intended to be prescribed only when all other treatments have failed, but it is frequently prescribed "off label" according to patient preference. It is a Schedule II drug and is illegal to take without a prescription.

Nervous Disorder: Any psychiatric disorder characterized by anxiety as a primary symptom. Physical symptoms include racing heart rates, increased sense of fear or anxiety, and a prevailing sense of danger. Common nervous disorders include panic attacks, post-traumatic stress disorder (PTSD), obsessive-compulsive disorder, social anxiety disorder, and other phobias. Nervous disorders are frequently associated with substance abuse.

Neurons: The individual cells that are aligned in sequences connecting the central nervous system as the primary communication system between the brain and various parts of the body.

Neurotransmitters: The chemical compounds that span the gap between neurons within the nervous system. Different chemical compounds will bind with different neural receptors that allow chemical messengers to travel along the same neural network without interfering with each other.

Nicotine: The main active ingredient found in tobacco plants. Nicotine is poisonous at even small doses but is generally consumed in extremely low doses through the inhalation of smoke or vaporized through special nicotine dabs. Nicotine is a stimulant and addictive, but it does not alter perceptions or induce intoxication.

Nonsteroidal Anti-Inflammatory Drugs (NSAIDs): A class of drugs used to treat mild aches, pains, and fevers by decreasing inflammation. Popular NSAID products include aspirin, naproxen, and ibuprofen. They are not regulated as controlled substances and are sold over the counter without a prescription. Many NSAIDs can provide the same level of pain relief as marijuana.

Off-Label Use: Refers to the practice of using a prescription drug for a purpose that it was not originally intended to treat. Doctors have some discretion as to how to prescribe medication for off-label use. Approximately 20% of legal prescriptions are given for off-label purposes. Marijuana is almost always prescribed off label since the FDA has not approved its use to treat any disease directly.

Opioids: A class of drugs derived from the poppy plant, which include opium, heroin, amphetamines, and a variety of prescription pain relievers (such as oxycodone, hydrocodone, and fentanyl). These drugs are primarily prescribed to relieve moderate to severe pain. They are highly addictive and are currently the leading cause of death due to drug overdoses. They are classified as Schedule II drugs and are illegal to take without a prescription.

Paranoia: A psychotic disorder in which the sufferer believes they are being persecuted. Usually involves fear or distrust of others and often includes delusions of grandeur. Paranoia is a common side effect of marijuana use.

Patch: A small bandage infused with drugs that can be transmitted through the skin into the bloodstream at a constant rate. Often used to deliver consistent doses over a long period of time. May be used for a wide variety of drugs, including nicotine, opioids, and THC or CBD concentrates.

Performance-Enhancing Drugs (PEDs): Any class of drug used to increase the natural capacities of athletic performance. Originally dominated mostly by anabolic steroids that increase muscle mass, PEDs

also include drugs that increase oxygen levels and reaction times. PEDs are banned by most sports associations.

Phencyclidine (PCP): A veterinary tranquilizer originally used for large animals (likes horses). Produces hallucinogenic effects and became a recreational drug in the 1960s, known as "Angel Dust." It frequently leads to psychosis and violent behaviors. It is often combined with marijuana and tobacco and is psychologically addictive with no current medical use in humans. It is a Schedule II drug that is illegal to use without a prescription.

Polarized Society: When society becomes divided between two opposing viewpoints that there is little middle ground left to find common agreement. A culture war often results from a polarized society.

Polydrug Use: When a user takes more than one recreational drug at the same time. Marijuana and alcohol are both the most common drugs used in combination with others. Polydrug combinations are responsible for most overdose deaths.

Posttraumatic Stress Disorder (PTSD): A nervous disorder caused by a traumatic event and usually characterized by nightmares, flashbacks, and severe anxiety when the memory of the trauma is triggered by related events.

Primed for Addiction: A biological condition in which the brain chemistry is altered to make it more receptive for dopamine stimulation. Usually caused by drug abuse (including marijuana use) at young ages. Youth who were primed for addiction are many times more likely to develop addictions of any substance throughout the course of their adult lives.

Prohibition (Eighteenth Amendment): A federal amendment to the U.S. Constitution that prohibited the manufacture and sale of alcohol. States and local districts also passed similar laws restricting alcohol. The federal amendment lasted from 1920 to 1933 when it was repealed by the Nineteenth Amendment. During that time period, users who purchased alcohol illegally often gathered together in central locations (speakeasies) where other illegal drugs were also sold.

Proposition 215 (1996): The California statewide initiative that legalized the medical use of marijuana. It was combined with a popular civil rights initiative (Proposition 209), which helped to ensure large

turnouts to the polls. California became the first state to legalize marijuana for medical use and to create a bureaucratic system to regulate it.

Psychoactive: Any ingredient within a substance that affects the mind, mood, or other mental processes.

Psychosis: A mental state characterized by a break from reality, usually involving hallucinations, paranoia, or other delusions. Any psychosis may be temporary or long term depending on the cause of the break.

Psychotropic: Refers to any affect from a substance that alters mood, perception, or behaviors. Almost all mood-enhancing drugs are psychotropic by definition.

Pure Food and Drug Act (1906): The federal law passed in 1906 to protect the public from harmful drugs or foods. The law was partially inspired by Upton Sinclair's book *The Jungle*, which exposed problems within the meatpacking industry. The same law also targeted advertisements for drugs that falsely claimed to cure any ailment. This law created the Food and Drug Administration and eventually led to the Harrison Narcotics Act (1914).

Relapse: Refers to situations when a substance abuser returns to the source of their addiction during their treatment process. In most addiction programs, relapse is considered an expected stage of the treatment cycle, and long-term counseling programs are used to deal with potential relapse.

Schedule I Drugs: The most strictly controlled category of drugs listed under the Controlled Substances Act of 1970. These drugs are most prone to addiction and have the least medical value with the fewest practical safeguards guaranteeing safe distribution and use. Marijuana is listed as a Schedule I drug, alongside heroin, LSD, ecstasy (MDMA) and mescaline, which is another hallucinogenic drug.

Self-Medicate: When a user chooses to treat their ailments without doctor's supervision or without a prescription. Marijuana is frequently justified by users as a form of self-medication for stress and anxiety.

Shaman: Often known as a "medicine man," shamans were individuals who lived on the margins of society and served as conduits between

the material physical world and the unseen spiritual world. Shamans often used herbs and other plants to treat ailments, produce hallucinations, and for other ritualistic purposes. In ancient times, marijuana was mostly used as a drug in limited extents for these purposes.

Sinsemilla: A form of marijuana harvested from unpollinated female plants. These include higher than normal levels of THC-rich resins, which are used for more potent marijuana buds. Many marijuana farmers tend to clone their plants so that they can harvest sinsemilla without the need for producing new seeds for replanting.

Social Anxiety Disorder: A type of nervous disorder that is characterized by unusual fear and anxiety in social situations, based on the patient's belief that others are continually judging and watching them. Marijuana often increases symptoms of social anxiety disorder, even though sufferers frequently self-medicate using marijuana as a preferred treatment option.

Speakeasy: An illegal bar that served alcoholic drinks during the Prohibition era. Speakeasies were also places where other illegal activities took place, including gambling, prostitution, and drug dealing. Speakeasies helped bring marijuana into large urban areas, which helped create the initial association between marijuana and the criminal underworld.

Synaptic Gap: The tiny space between neurons in the nervous system. Neurotransmitters must pass the synaptic gap in order to communicate information from one neuron to the next. Most drugs affect the nervous system at the point of the synaptic gap by interfering with neurotransmitters or neuroreceptors.

Synthetic Marijuana: A chemical substance created in a laboratory to mimic the effects of THC. The first versions were legally sold as incense under the brand names of "Spice" and "K2." They were marketed as marijuana substitutes, but their widespread use led to a rash of severe drug overdose reactions, including deaths. Though later outlawed, these products continue to be used illegally as recreational drugs.

T-Breaks: Short for "tolerance break." Marijuana users can develop tolerance to the dopamine effects of THC, resulting in a decline in the general euphoric feelings. Users may take T-breaks for up to six months by avoiding marijuana and shifting to alcohol as the main source of their

intoxication in the hope of regaining the original marijuana experience. T-breaks are a sign of a substance abuse disorder.

Tenth Amendment: The Tenth Amendment to the U.S. Constitution states that any power that is not expressly designated to the federal government will remain with the state government. That is how state legislatures can choose to legalize marijuana even when it remains illegal at the federal level. The power of most criminal enforcement is not explicitly listed in the Constitution.

Tetrahydrocannabinol (THC): The primary psychoactive ingredient in the *Cannabis* plant that produces the mind-altering effects that marijuana is mostly known for. It is one of more than 100 psychoactive compounds found in the plant.

Tincture: A liquid solution usually containing alcohol and some other drug component. THC tinctures are packaged in small bottles and are administered with eye droppers under the tongue, or drops are added directly to foods. Tinctures may contain very high concentrations of THC and may be contaminated with other drugs.

Tolerance: Refers to the gradually decreasing effects of a drug after repeated uses. Tolerance may be caused by biochemical changes in neural receptors, or it may be learned through behavior adaptation. Tolerance may also be acute (short term) or chronic (long term). Marijuana leads to both biochemical and learned tolerance and tends to be acute, though it may become chronic for young users.

Vape Pens: Another term for an electronic cigarette that vaporizes drug substances without burning the material. Vaping pens were initially marketed as a smokeless alternative to smoking tobacco but has become a popular tool for ingesting a wide variety of drugs, including CBD, THC, and polydrug combinations.

Vaping: Refers to the practice of ingesting drugs through e-cigarettes or vape pens. Vaping has been targeted by the FDA and the CDC as a dangerous activity that is prone to contamination and overdosing. Vaping delivers very high concentrations of drugs, and the dabs frequently contain a variety of other drugs in addition to that advertised by the seller.

War on Drugs: Refers to the presidential policy that stressed the importance of reducing drug abuse among teens. The first "War on Drugs" campaign was initiated by President Richard Nixon after signing the Controlled Substances Act of 1970. The most famous "War on Drugs" was launched by President Ronald Reagan during the 1980s, with the campaign slogan "Just Say No." President Clinton stopped the "War on Drugs" campaign in the 1990s, and it has not been rejuvenated.

Withdrawal Symptoms: The range of reactions that follows when habitual users stop using a drug. Physical symptoms of withdrawal may include reactions that require a doctor's supervision, especially in cases of chemical dependency. Less pronounced symptoms also follow psychological addictions, but they may also exhibit mild physical reactions. Withdrawal symptoms are a major reason why users relapse into addiction.

Directory of Resources

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ONLINE RESOURCES

Centers for Disease Control and Prevention (CDC) Resource Page on "Marijuana and Public Health"
https://www.cdc.gov/marijuana/index.htm
This website includes information on the health effects, statistics, and recommendations related to marijuana use, abuse, and addiction.

Drug Enforcement Agency (DEA) Marijuana Fact Sheet
https://www.dea.gov/factsheets/marijuana
This website includes information on the on the characteristics of marijuana, the various forms by which it is sold legally and illegally, and the laws and penalties associated with enforcement.

Government-Sponsored Addiction Treatment Resource Locator
https://findtreatment.gov/
This website is a service of the Substance Abuse and Mental Health Services Administration. It serves as one-stop resource for individuals looking to find more information on treating substance abuse disorders.

Institute for Behavior and Health
https://www.ibhinc.org/
This website is hosted by an organization dedicated to the reducing illegal drug use among teens.

The National institute on Drug Abuse (NIDA)
www.drugabuse.gov
The website includes a very large database on drug statistics, drug usage, and recommendations for prevention and treatment of addiction disorders. Specific pages on marijuana may be found at: https://www.drugabuse.gov/drug-topics/marijuana

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About the Author

Aharon W. Zorea, PhD, is professor of history at the University of Wisconsin–Platteville. His published works include other Greenwood/ABC-CLIO titles, *Finding the Fountain of Youth: The Science and Controversy behind Extending Life and Cheating Death* (2017), *Steroids* (Health and Medical Issues Today) (2014), and *Birth Control* (Health and Medical Issues Today) (2012), as well as *In the Image of God: A Christian Response to Capital Punishment* (2000). He has been teaching for more than 20 years and has written more than 60 articles on politics and legal and social policy. Zorea holds a master's from Purdue University and a doctorate in policy history from Saint Louis University. His articles and recorded lectures may be found through a variety of outlets online.