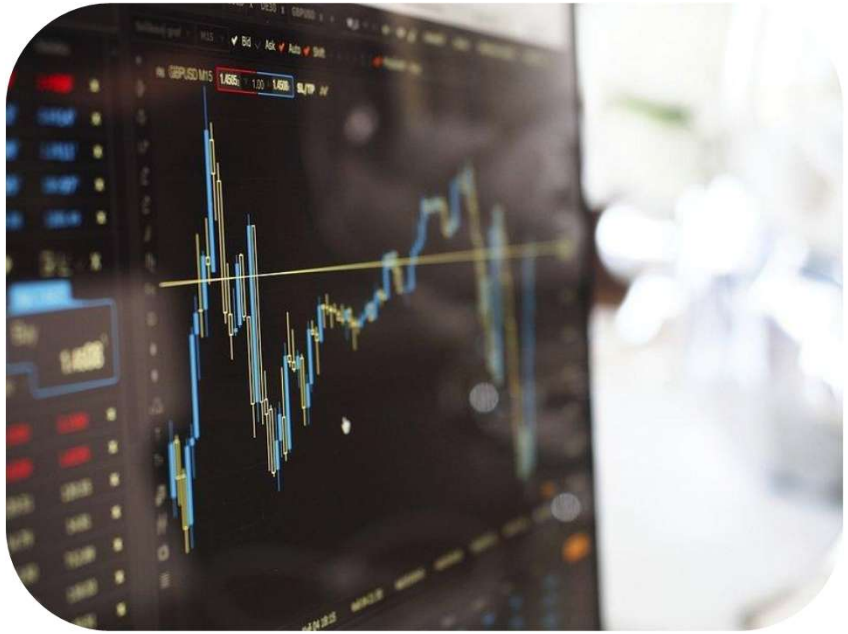
October 2025

Cannabis Prevalence, Risks, & Health Consequences

Jessica Hulsey
Addiction Policy Forum

ADDICTION POLICY FORUM

Cannabis Use and Addiction Prevalence



Numerous Cannabis Products Available Nationwide

FDA-Approved Medications

Some synthetic forms of THC and CBD are FDA-approved medications, including

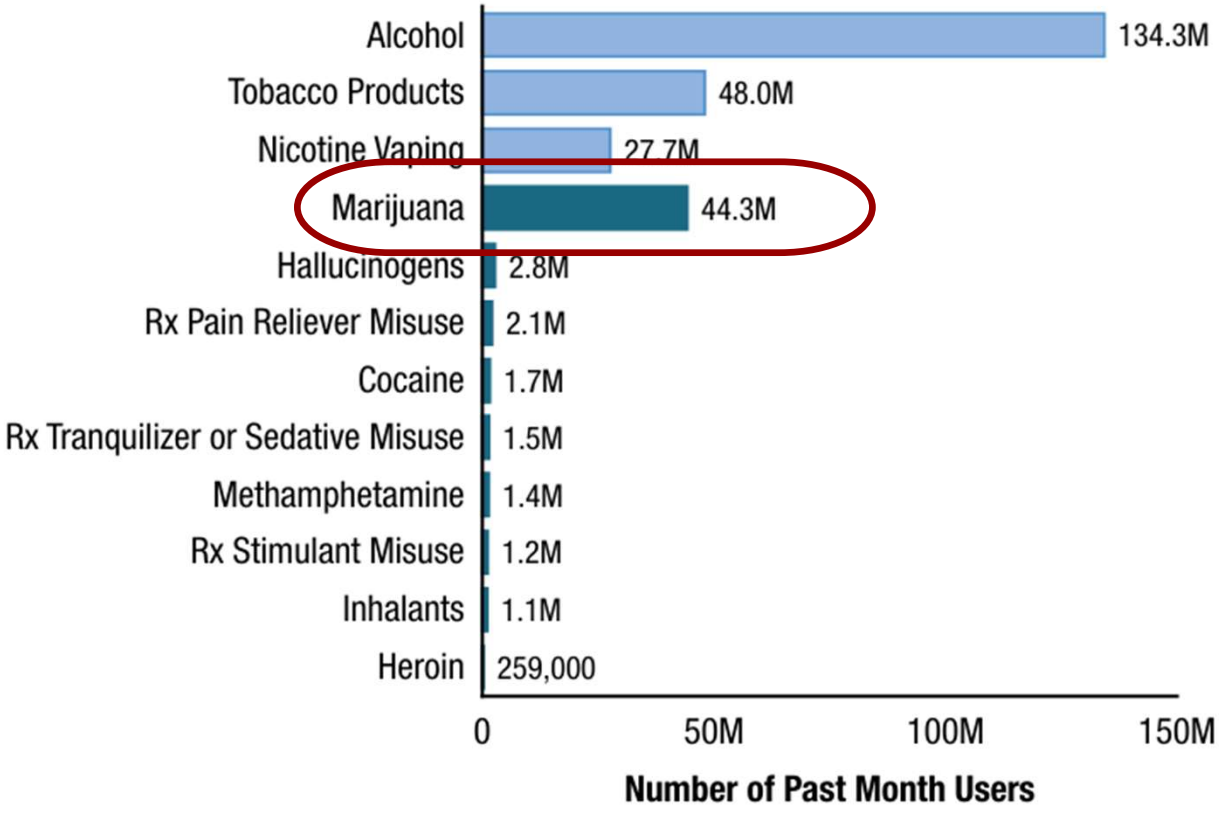
- Dronabinol (Marinol, Syndros) for anorexia and weight loss for AIDS patients and for nausea and vomiting associated with cancer treatment.

- Nabilone (Cesamet) for chemotherapy-induced nausea.

- Epidiolex, a purified form of CBD, has been approved to treat seizures associated with two rare forms of epilepsy.

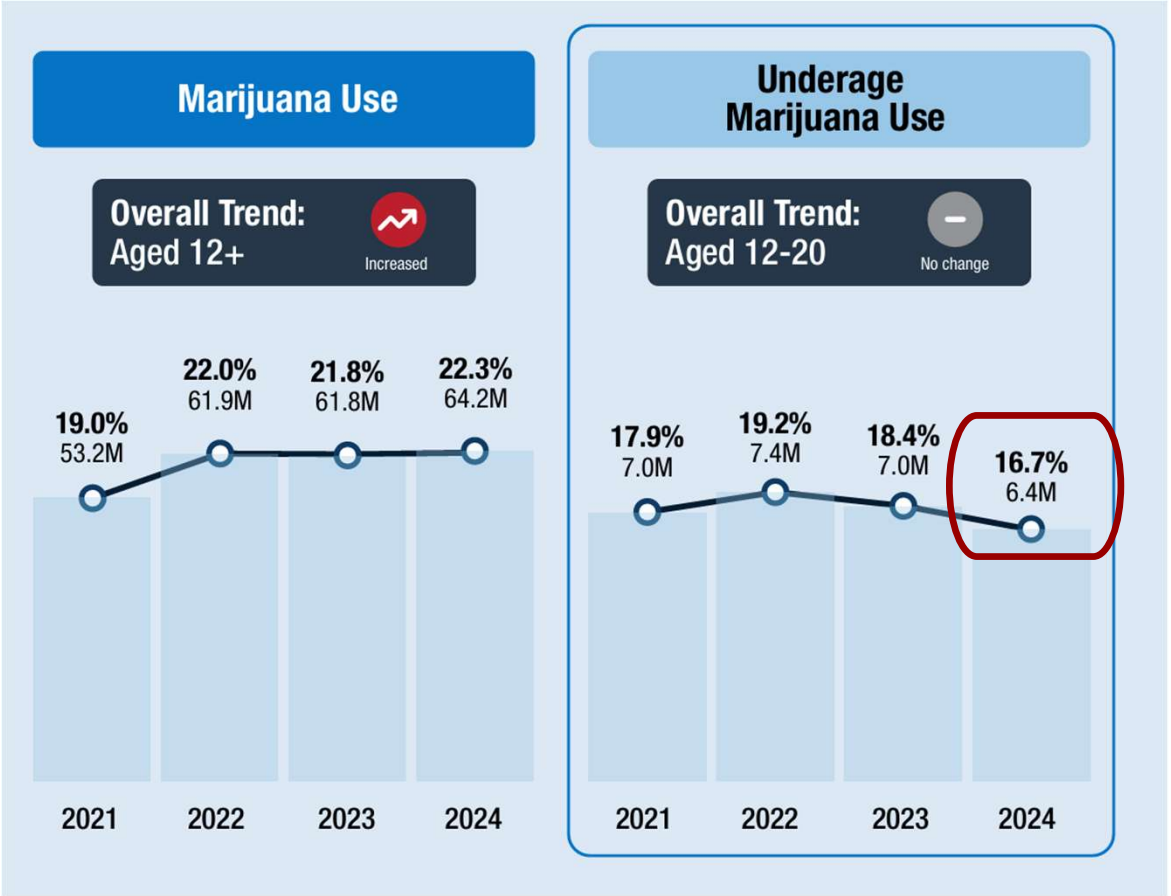
Cannabis itself does not have FDA approval for any health condition (indication).

Past Month Substance Use Nationwide: 44 million People 12 and Older Used Marijuana



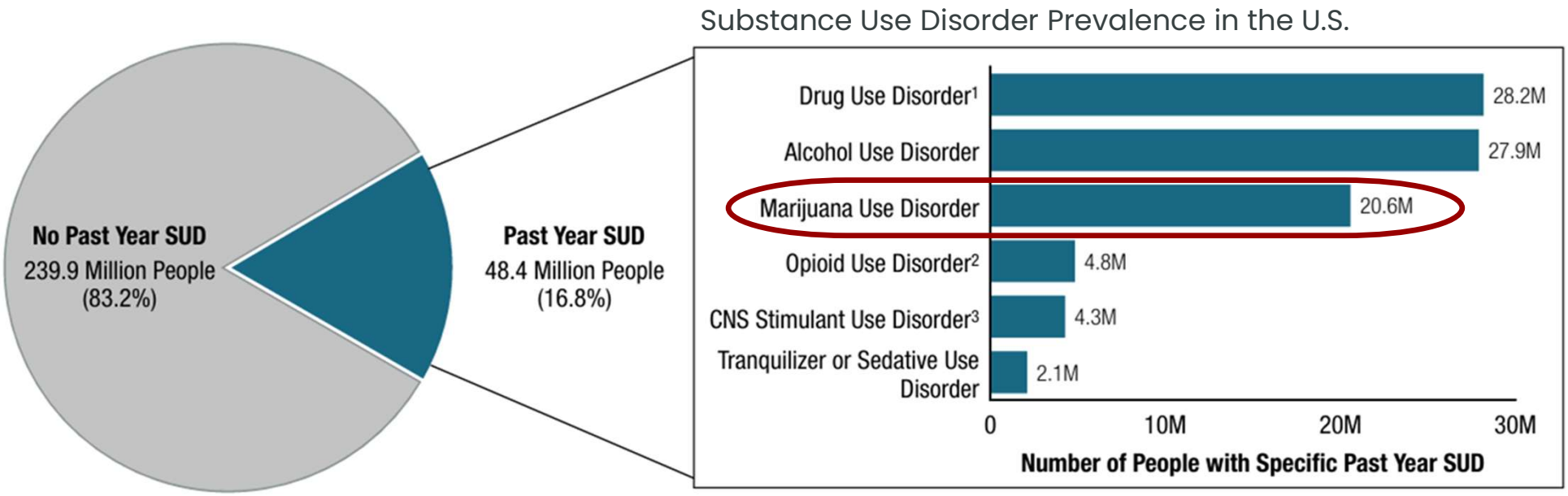
NSDUH 2024

Past Month Adolescent Marijuana Use



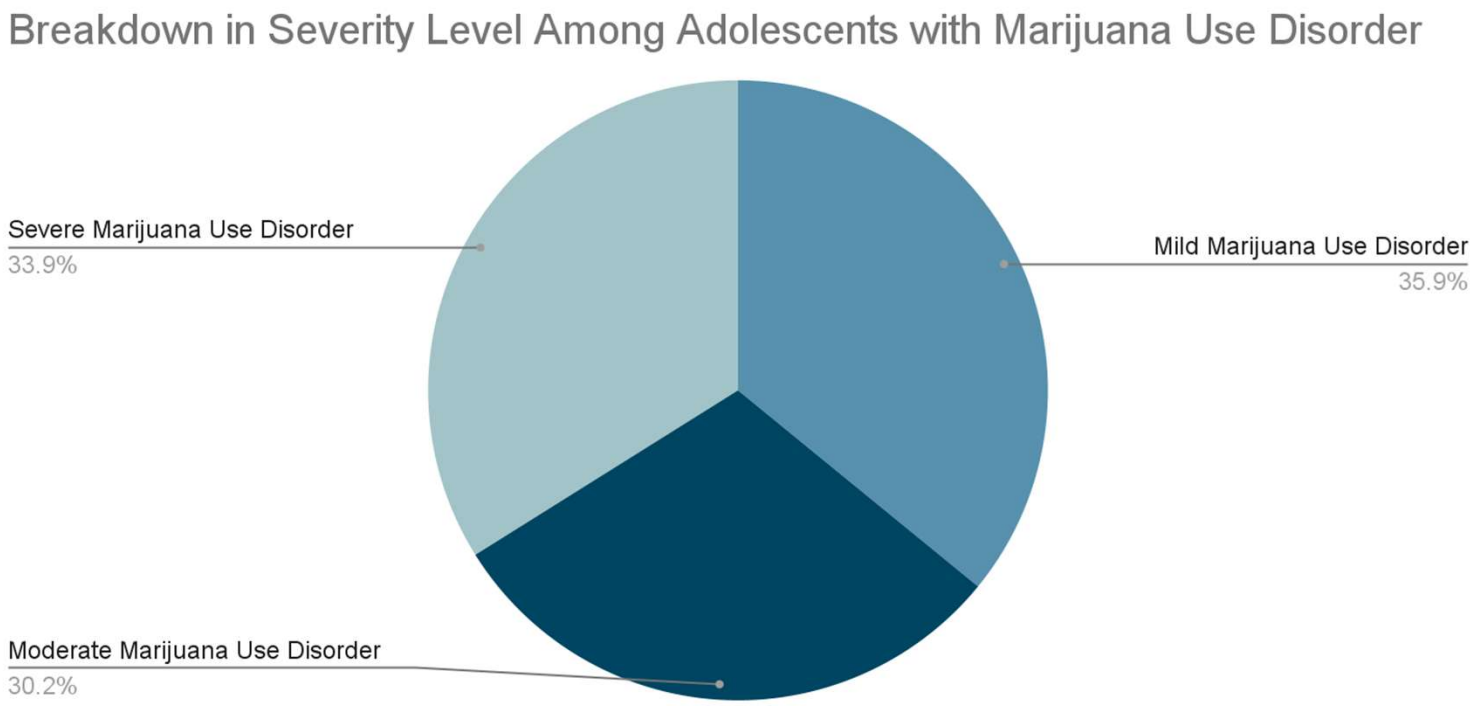
NSDUH 2024

20.6 million Individuals Have a Marijuana Use Disorder



NSDUH 2024

Among Adolescents with Marijuana Use Disorder, 1 in 3 have a Severe Disorder



NSDUH 2024

How is a Marijuana Use Disorder Diagnosed?

The Diagnostic and Statistical Manual of Mental Disorders, DSM–5, defines cannabis use disorder as the presence of impairment or distress across four categories: 1) impaired control; 2) social problems; 3) risky use, and 4) physical dependence. They include:

- Cannabis is taken in larger amounts or used over a longer period than intended
- Persistent desire to cut down with unsuccessful attempts
- Excessive time spent acquiring cannabis, using cannabis, or recovering from its effects
- Cravings for cannabis use
- Recurrent use resulting in neglect of social obligations
- Continued use despite social or interpersonal problems
- Important social, occupational, or recreational activities foregone to be able to use cannabis
- Continued use despite physical harm
- Continued use despite physical or psychological problems associated with cannabis use
- Tolerance
- Withdrawal symptoms when not using cannabis

9

Patel, Cannabis Use Disorder, 2024

Symptoms and Consequences for Individuals with Marijuana Use Disorder

- Withdrawal-linked distress, which can include: irritability, anger, or aggression, nervousness or anxiety, sleep difficulty (ie, insomnia, disturbing dreams), decreased appetite or weight loss, depressed mood
- Decreased sense of life satisfaction and achievement compared to the general population
- Altered brain development, cognitive impairment
- Poor educational outcome, increased likelihood of dropping out of school, and lower intelligence quotient among frequent users (particularly during adolescence)
- Cognitive and motor-skills driving impairments

Patel, Cannabis Use Disorder, 2024
Connor et al, Addiction, 2022

3 of 10 people who use cannabis have a Cannabis Use Disorder

"While not all marijuana users experience problems, nearly 3 of 10 marijuana users manifested a marijuana use disorder…"

JAMA Psychiatry, 2015

JAMA Psychiatry

Original Investigation FREE

Prevalence of Marijuana Use Disorders in the United States Between 2001-2002 and 2012-2013

Deborah S. Hasin, PhD[1,2,3]; Tulshi D. Saha, PhD[4]; Bradley T. Kerridge, PhD[5] ; et al

» Author Affiliations | Article Information

RELATED ARTICLES FIGURES

Abstract

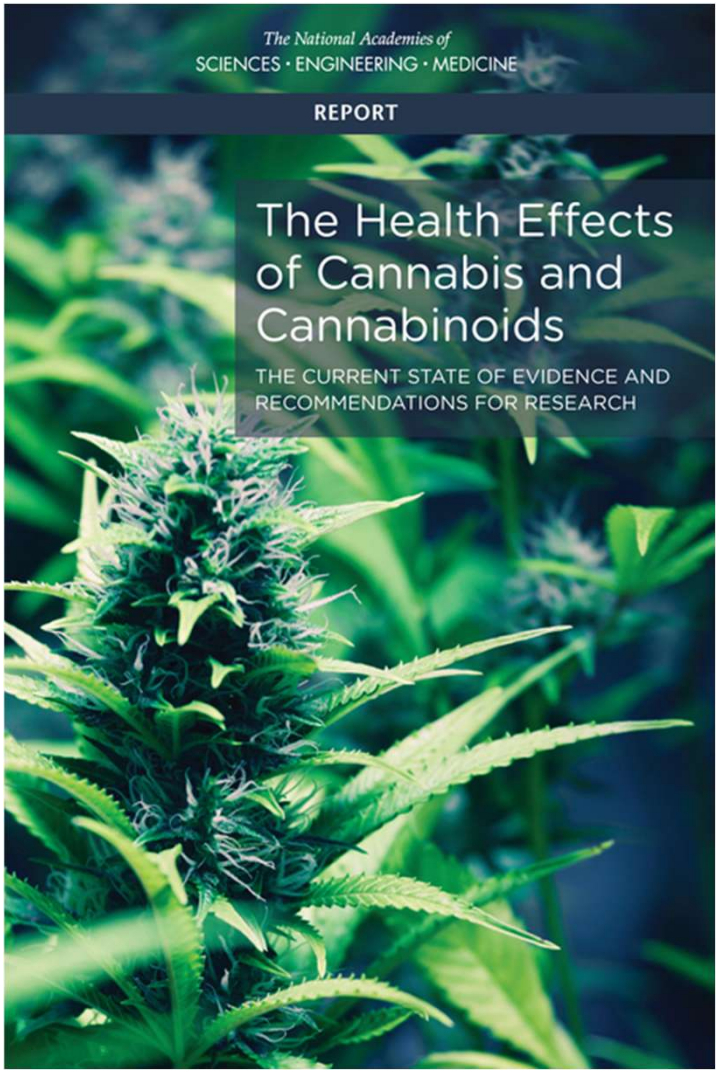
Importance Laws and attitudes toward marijuana in the United States are becoming more permissive but little is known about whether the prevalence rates of marijuana use and marijuana use disorders have changed in the 21st century.

Objective To present nationally representative information on the past-year prevalence rates of marijuana use, marijuana use disorder, and marijuana use disorder among marijuana users in the US adult general population and whether this has changed between 2001-2002 and 2012-2013.

Design, Setting, and Participants Face-to-face interviews conducted in surveys of 2 nationally representative samples of US adults: the National Epidemiologic Survey on Alcohol and Related Conditions (data collected April

Cannabis and Health & Psychosocial Effects

- Impairs the performance in the “domains of learning, memory, and attention.”
- Use during adolescence is related to “impairments in academic achievement and education, employment and income, and social relationships and social roles.”
- Cannabis use increases the “risk of developing schizophrenia and other psychoses; the higher the use, the greater the risk.”



National Academies of Sciences, Engineering, and Medicine, *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research, 2017.*

Risk of developing cannabis use disorder is even greater for people who begin to use it before age 18

"Our data confirm cross-sectional (e.g., Anthony and Petronis, 1995) and prospective (e.g., Grant et al., 2001) research supporting the view that youth is a developmental period of high risk for becoming either abusive of or dependent on substances. Specifically, our study provides three major findings. First, we observed that among the recent onset users, the only demographic variable that was reliably related to AUD and CUD was chronological age."

Drug and Alcohol Dependence, 2008

Drug and Alcohol Dependence
Volume 92, Issues 1–3, 1 January 2008, Pages 239-247

Likelihood of developing an alcohol and cannabis use disorder during youth: Association with recent use and age

Ken C. Winters, Chih-Yuan S. Lee

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https://doi.org/10.1016/j.drugalcdep.2007.08.005 Get rights and content

Abstract

Aim

We extend the literature on the association of early onset of drug use and estimated risk for developing a substance use disorder (SUD) by investigating the risk that recent onset of alcohol and cannabis use confers for developing a substance use disorder at each chronological age of adolescence and young adulthood (12–21-years-old).

Design

Using 2003 data from the National Survey on Drug Use and Health [Substance Abuse Mental Health Service Administration (SAMHSA), 2004. Overview of Findings from the 2003 National Survey on Drug Use and Health. Office of Applied Studies, NSDUH Series H-24, DHHS Publication No. SMA-04-3963, Rockville, MD], we computed separate risk indices for developing an alcohol and cannabis use disorder for recent (prior 2 years) alcohol and cannabis users, respectively, at each age from 12 to 21 years of age, and compared estimated risk to recent onsets users among respondents aged 22–26.

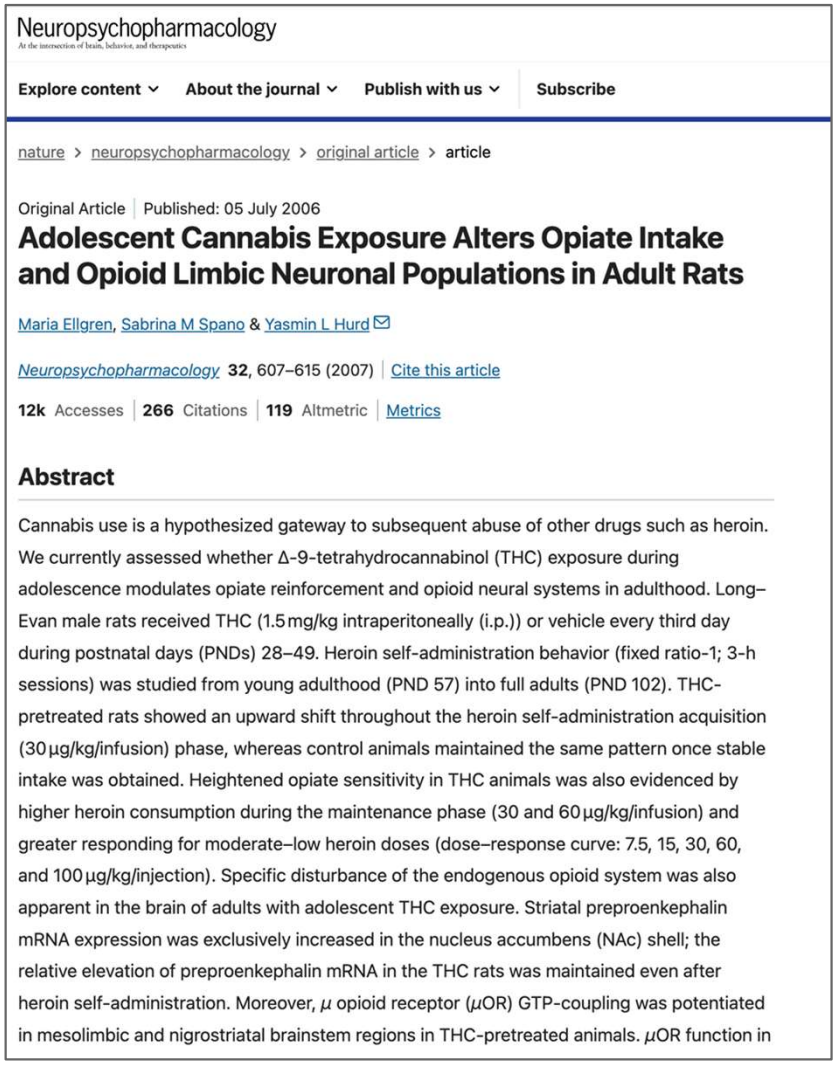
Findings

The results indicated that the teenage years were strongly linked to an elevated risk

Adolescent Exposure Increases Sensitivity to Other Drugs

Preclinical studies have found that THC exposure during adolescence can increase sensitivity to the rewarding effects of other drugs later in life. (Cross-Sensitivity)

Neuropsychopharmacology, 2007



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nature > neuropsychopharmacology > original article > article

Original Article | Published: 05 July 2006

Adolescent Cannabis Exposure Alters Opiate Intake and Opioid Limbic Neuronal Populations in Adult Rats

Maria Ellgren, Sabrina M Spano & Yasmin L Hurd

Neuropsychopharmacology **32**, 607–615 (2007) | Cite this article

12k Accesses | **266** Citations | **119** Altmetric | Metrics

Abstract

Cannabis use is a hypothesized gateway to subsequent abuse of other drugs such as heroin. We currently assessed whether Δ-9-tetrahydrocannabinol (THC) exposure during adolescence modulates opiate reinforcement and opioid neural systems in adulthood. Long–Evan male rats received THC (1.5 mg/kg intraperitoneally (i.p.)) or vehicle every third day during postnatal days (PNDs) 28–49. Heroin self-administration behavior (fixed ratio-1; 3-h sessions) was studied from young adulthood (PND 57) into full adults (PND 102). THC-pretreated rats showed an upward shift throughout the heroin self-administration acquisition (30 μg/kg/infusion) phase, whereas control animals maintained the same pattern once stable intake was obtained. Heightened opiate sensitivity in THC animals was also evidenced by higher heroin consumption during the maintenance phase (30 and 60 μg/kg/infusion) and greater responding for moderate–low heroin doses (dose–response curve: 7.5, 15, 30, 60, and 100 μg/kg/injection). Specific disturbance of the endogenous opioid system was also apparent in the brain of adults with adolescent THC exposure. Striatal preproenkephalin mRNA expression was exclusively increased in the nucleus accumbens (NAc) shell; the relative elevation of preproenkephalin mRNA in the THC rats was maintained even after heroin self-administration. Moreover, μ opioid receptor (μOR) GTP-coupling was potentiated in mesolimbic and nigrostriatal brainstem regions in THC-pretreated animals. μOR function in

Cannabis and Prenatal Exposure

Studies have shown that in utero exposure to cannabis is associated with significant negative outcomes including fetal growth restriction, low birth weig and preterm delivery.

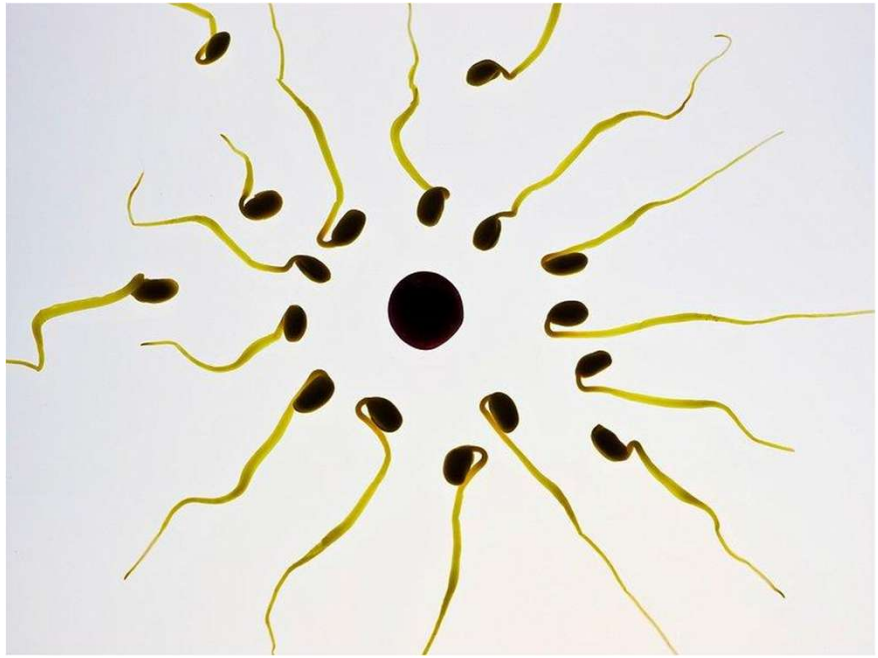
Studies:

- Petrangelo et al, J Obstet Gynaecol, 2019
- Corsi et al, JAMA. 2019
- National Academies of Sciences, Engineering, and Medicine 2017

Cannabis and Male Fertility

Studies show that cannabis can have negative effects on male fertility, including reduced sperm count and concentration, changes in sperm motility and morphology, and hormone changes.

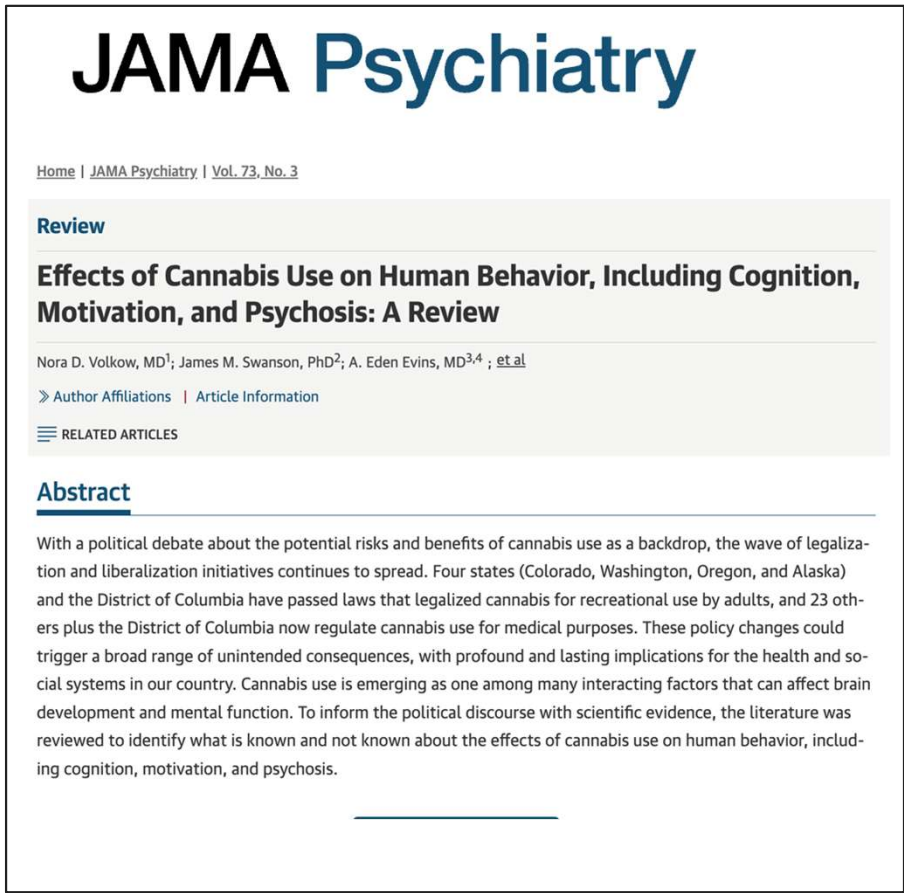
Srinivasan et al, Cureus Journal of Medical Science, 2021



Cannabis and Psychosis and Schizophrenia Risk

Long-term or frequent cannabis use has been linked to increased risk of psychosis or schizophrenia in some users.

JAMA Psychiatry, 2016



JAMA Psychiatry

Home | JAMA Psychiatry | Vol. 73, No. 3

Review

Effects of Cannabis Use on Human Behavior, Including Cognition, Motivation, and Psychosis: A Review

Nora D. Volkow, MD[1]; James M. Swanson, PhD[2]; A. Eden Evins, MD[3,4] ; et al

Author Affiliations | Article Information

RELATED ARTICLES

Abstract

With a political debate about the potential risks and benefits of cannabis use as a backdrop, the wave of legalization and liberalization initiatives continues to spread. Four states (Colorado, Washington, Oregon, and Alaska) and the District of Columbia have passed laws that legalized cannabis for recreational use by adults, and 23 others plus the District of Columbia now regulate cannabis use for medical purposes. These policy changes could trigger a broad range of unintended consequences, with profound and lasting implications for the health and social systems in our country. Cannabis use is emerging as one among many interacting factors that can affect brain development and mental function. To inform the political discourse with scientific evidence, the literature was reviewed to identify what is known and not known about the effects of cannabis use on human behavior, including cognition, motivation, and psychosis.

New Studies

Cannabis Use Linked to Higher Risk of Heart Attack in Adults Under 50, Study Finds

Adults under 50 who use marijuana may face a significantly higher risk of heart attack, according to a new study published in the Journal of the American College of Cardiology (JACC).

Researchers analyzed data from more than 4.6 million adults and found that individuals under 50 who use cannabis were more than six times as likely to suffer a heart attack compared to non-users.

Cannabis use associated with increased suicide risk, even controlling for depression

A recent systematic review and meta-analysis published in Drug and Alcohol Dependence delves into the complex relationship between cannabis use, depression, and suicidal behavior. Cannabis use has been found to be a risk factor for depression, and consistent cannabis use has been associated with suicidality, suicidal behaviors, and actions, though the findings have been mixed.

Key findings showed that cannabis use is associated with an increased risk of suicidal ideation and attempts, even when controlling for depression. Among adolescents, cannabis use was linked to a 1.85 times higher likelihood of attempting suicide, whereas for adults, the risk of suicidal thoughts was almost doubled.

Thank You

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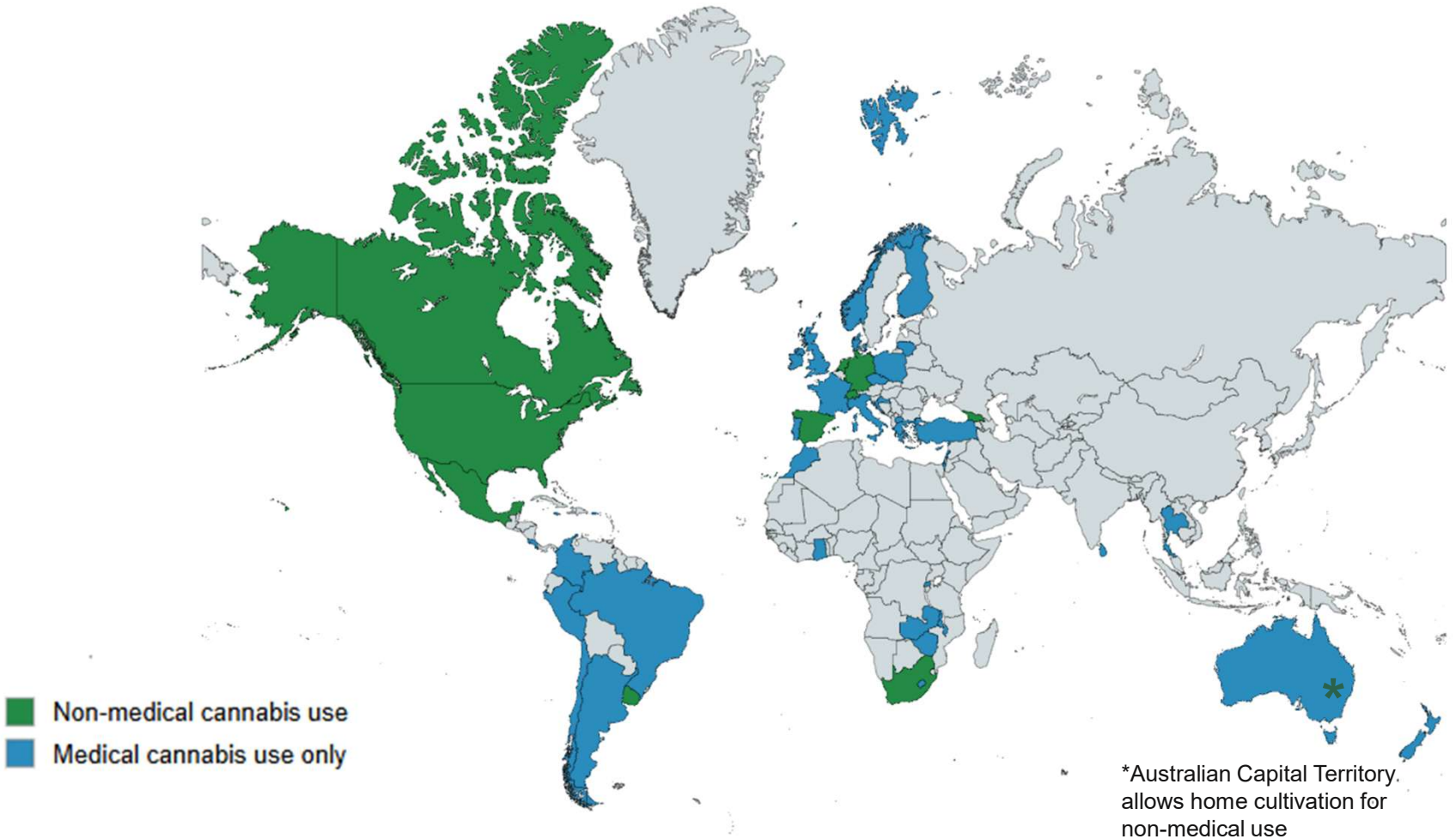
Cannabis Legalization in the United States and Abroad: Legalization's Impacts on Use

Rosalie Liccardo Pacula
Sol Price School of Public Policy
Leonard D. Schaeffer Center for Health Policy & Economics
University of Southern California

Global medical and non-medical cannabis policies (Jan 2025)

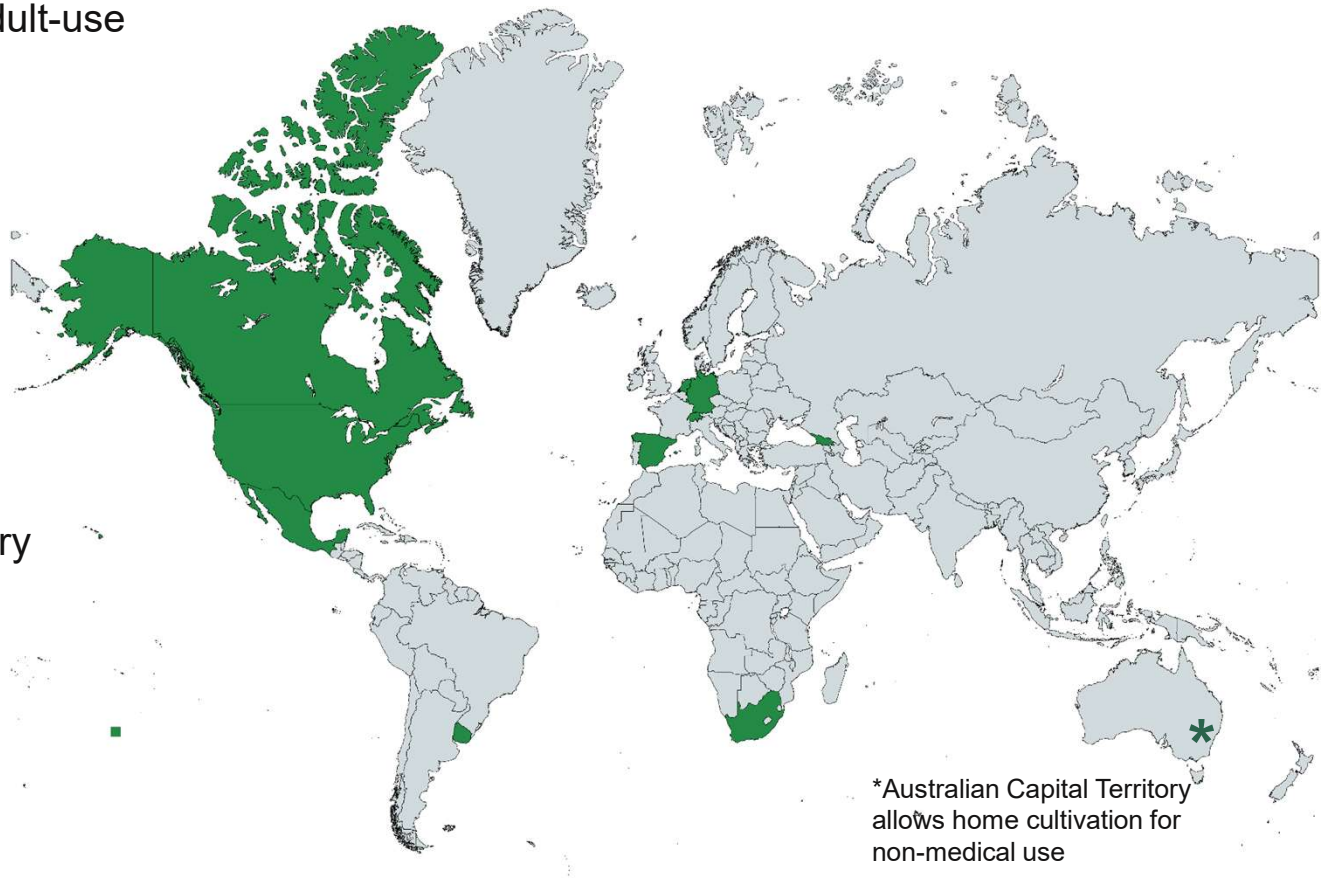


*Australian Capital Territory allows home cultivation for non-medical use

Global non-medical cannabis policy liberalization (Jan 2025)

Countries with some form of adult-use liberalization, beyond decriminalization

- US States
- Canada
- Uruguay
- Malta
- Germany
- South Africa
- Luxembourg
- Mexico
- Australian Capital Territory
- Spain
- Georgia
- Switzerland
- The Netherlands

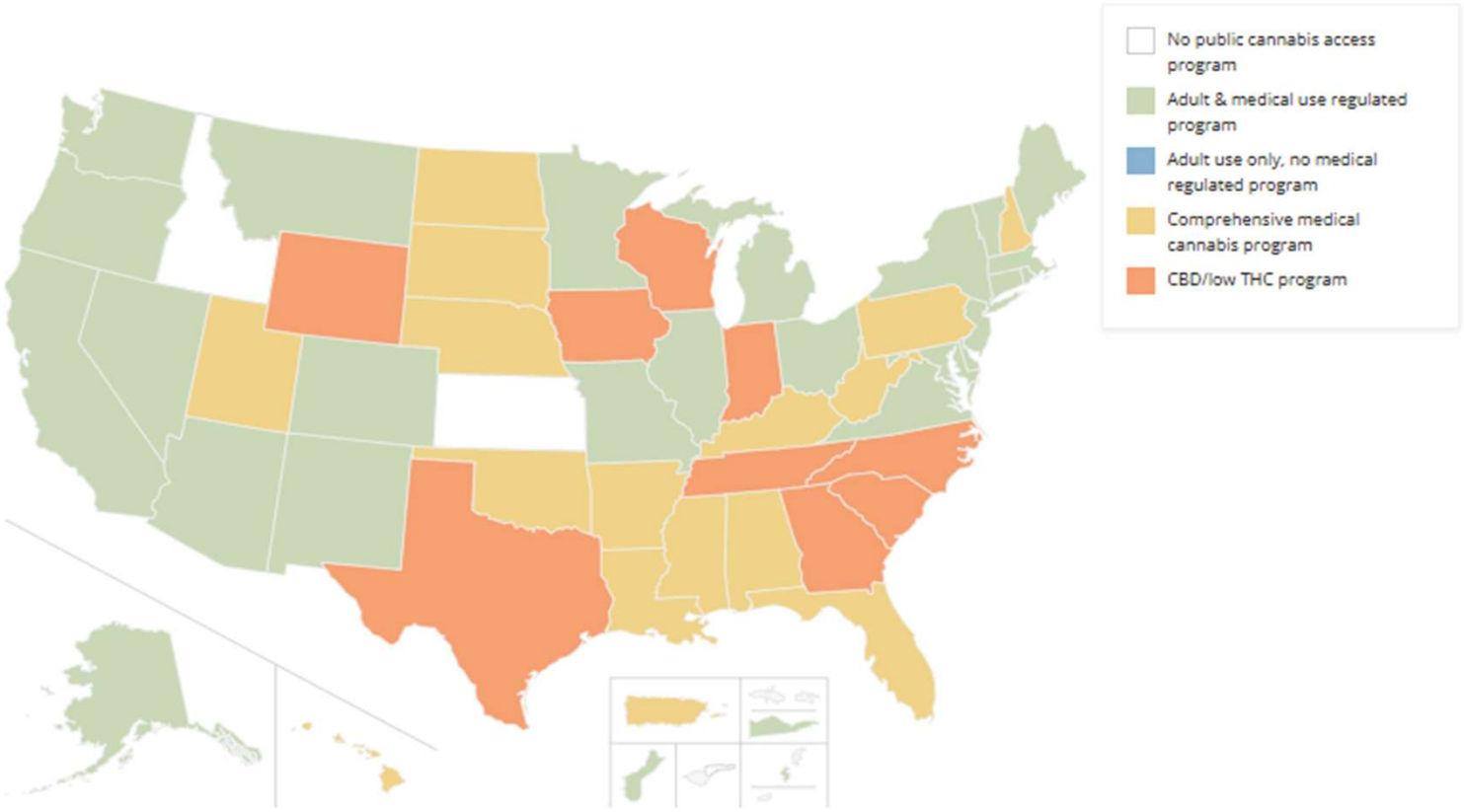


*Australian Capital Territory allows home cultivation for non-medical use

State Cannabis Policies as of June 2025

Cannabis is now legal for medical or adult use in more than three-quarters of the US states

Farm Bill of 2018 legalized hemp, so intoxicating CBD products also available in most states



NOTES: CBD = cannabidiol; THC = delta-9-tetrahydrocannabinol. The map does not include state policies instituted in response to the 2018 Agriculture Improvement Act (PL-115-334).
SOURCE: National Conference of State Legislatures.

Lots of interest in understanding the impact of these policies on use

- There has been a general consensus in the literature that:
  - Legalization increases adult prevalence of cannabis use and daily use
  - Legalization/commercialization is associated with increases in cannabis use disorder
- But there has also been some very inconsistent findings:
  - Impact of legalization on youth cannabis use?
  - Impact of legalization on impaired driving / alcohol use?
- This is a difficult question to answer definitively due to:
  1) Different ways of measuring cannabis use
  2) Different ways to represent legal cannabis policies
  3) Different methods and data that are applied across studies, not all of which are designed for causal inference

Problem #1: Measuring demand using any single metric is Incomplete and our current measures are poor

- Prevalence of different types of users (lifetime, past year, past month, near daily, etc.) tells us little about quantity consumed, only people engaging in the market
  - Occasional users generally use less overall, but unclear if it is less at one point in time
  - More regular consumers use higher amounts on average
  - Near daily users use more frequently, but not necessarily greater overall amount as those who binge on the weekend
  - Prevalence of these users groups in any sample will tell different story about amount consumed

What we really care about is amount consumed, and mode(s) of administration

Cannabis (the plant):

- all plant material, buds only
- pre-roll (infused or non-infused)

Cannabis-infused products? (ml, mg, ounces)

What about hemp-based products?

What about THC and THC-like cannabinoids or synthetics?

Problem #2: We have failed to acknowledge the variation that exists across states and countries in important policy elements

- Legal cannabis markets look different in different countries

	Uruguay	Canada	US: California	US: Connecticut
Legalization looks different across different jurisdictions				
	Only cannabis plant can be sold and only in pharmacies potency is either **9%, 15% and < 20% THC** Alternative sources: Cannabis Social Club or home cultivation avg THC content unknown No other products legally allowed	Only flower allowed in first 18 months. Other products depend on province – two provinces do not allow edibles or vapes to be sold. THC levels in flower range: 15-30%, **average is 20-25% THC** Home cultivation allowed No mixing of cannabis and other products Cap THC per package to 10 mg	All cannabis products allowed; THC levels of flower range 18%-40%, **modal THC is 30% ;** vapes have THC potency > 90% Allows cannabis buyers clubs and home cultivation. No caps on cannabis potency or bans on flavorings Cap THC per serving to 10 mg (edibles) and cap THC per package to 100 mg	THC levels **capped at 30%** for flower, regard-less of bud or pre-roll. Vape pens and concentrates also capped at 60% unless pre-filled No cannabis buyers clubs. Home cultivation is allowed. Edibles capped at 5 mg/ serving; 100 mg/ package

In 2019, we convened an expert panel to identify and rank cannabis regulations most likely to reduce excess use, any youth use, and DUI

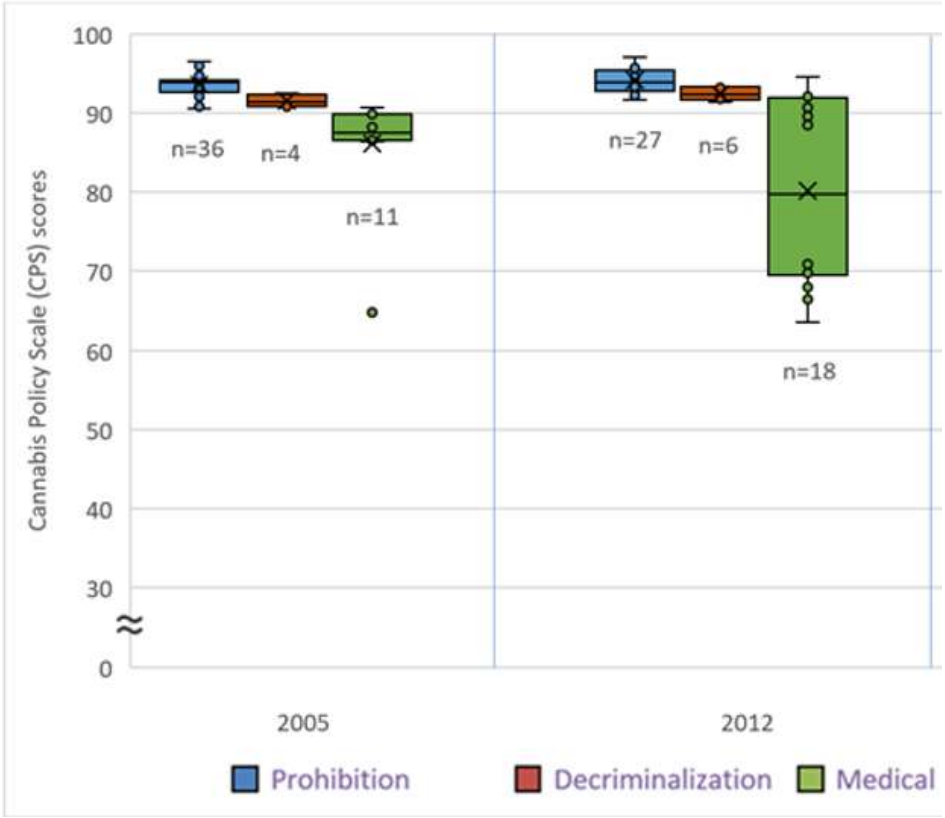
- We defined what we meant by cannabis policy: "Laws, regulations, and practices used to influence cannabis consumption which might include the presence or absence of supporting legislation, and/or operational aspects that reflect their implementation, enforcement, or resource allocation at the state level."
- We tracked these laws across all 50 states and based on implementation and perceived effectiveness computed a policy scale.

Blanchette, J. G., Pacula, R. L., Smart, R., Lira, M. C., Boustead, A. E., Caulkins, J. P., Kerr W., Kilmer B., Kleiman M, Treffers R & Naimi, T. S. (2022). Rating the comparative efficacy of state-level cannabis policies on recreational cannabis markets in the United States. *Int' Journal of Drug Policy*, 106, 103744.

1. Advertising Restrictions
2. Cannabis Possession Limits
3. Clean Air and Smoke Free Laws
4. Cultivation and Manufacturing Operations Restrictions and Requirements
5. Delivery Restrictions to Consumers
6. Home Cultivation Restrictions
7. Impaired Driving Laws
8. MC Restrictions and Requirements
9. Packaging and Labeling Restrictions and Requirements
10. Penalties for Adults who Possess Cannabis for Personal Use
11. Physical Retail Availability Restrictions
12. Product Design Restrictions and Requirements
13. Retail Price Restrictions
14. Retail Operations
15. State Monopoly
16. Taxes
17. Track-and-trace Requirements
18. Youth Policies

Big variation across states captured by CPS not reflected in simple dichotomous measuresof type of cannabis policy

Legalized states vary in their approaches to regulating cannabis as reflected in the Cannabis Policy Scale, which summarizes implementation of 18 different areas of regulation across the states, and then weights them on expected efficacy for reducing excess use



Blanchette JG, Pacula RL, Smart R, Lira MC, Pessar SC, and TS Naimi. (2022). "The Cannabis Policy Scale: A New Research and Surveillance Tool for U.S. States." *Journal of Studies on Drugs and Alcohol*. 83(6): 829-838.

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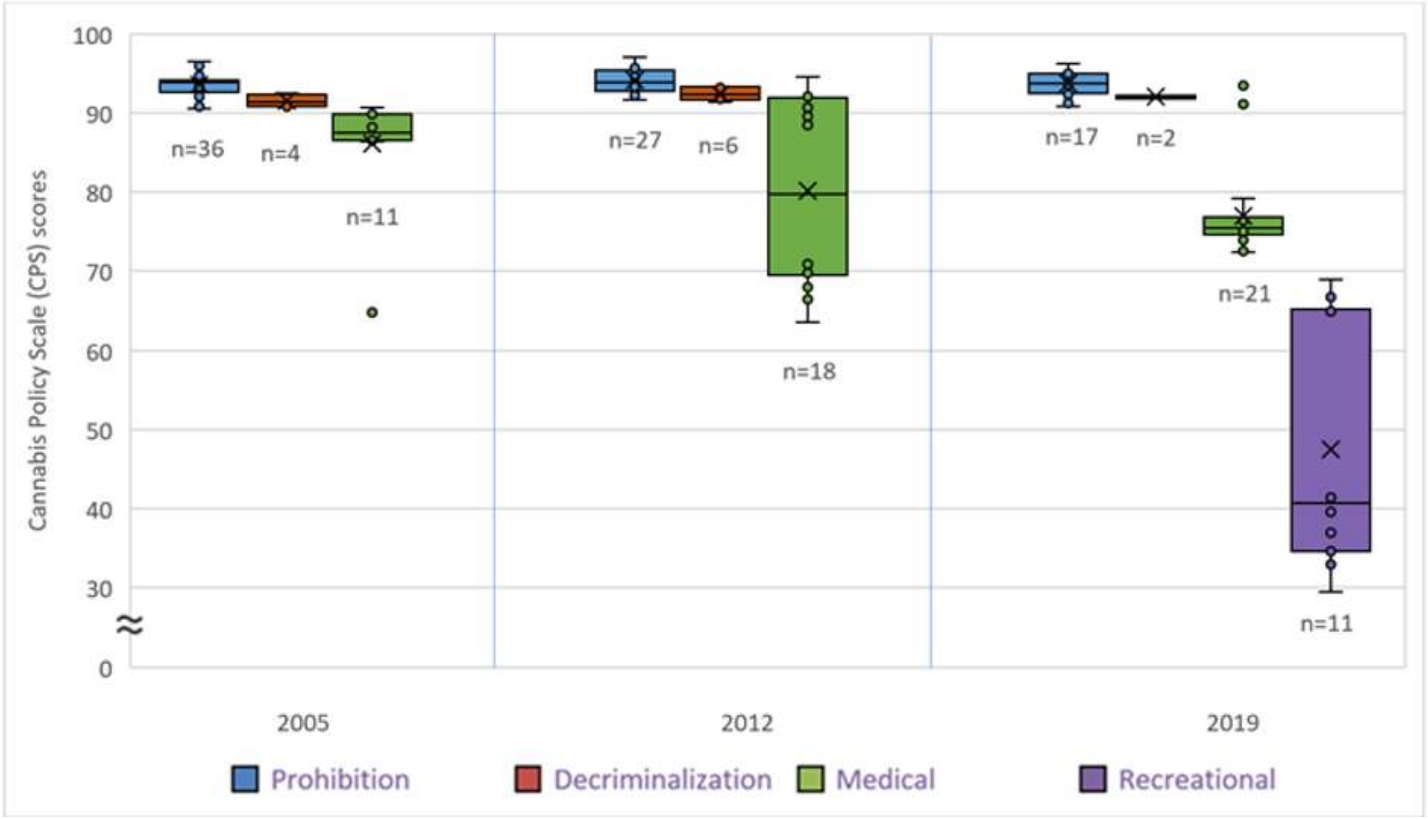


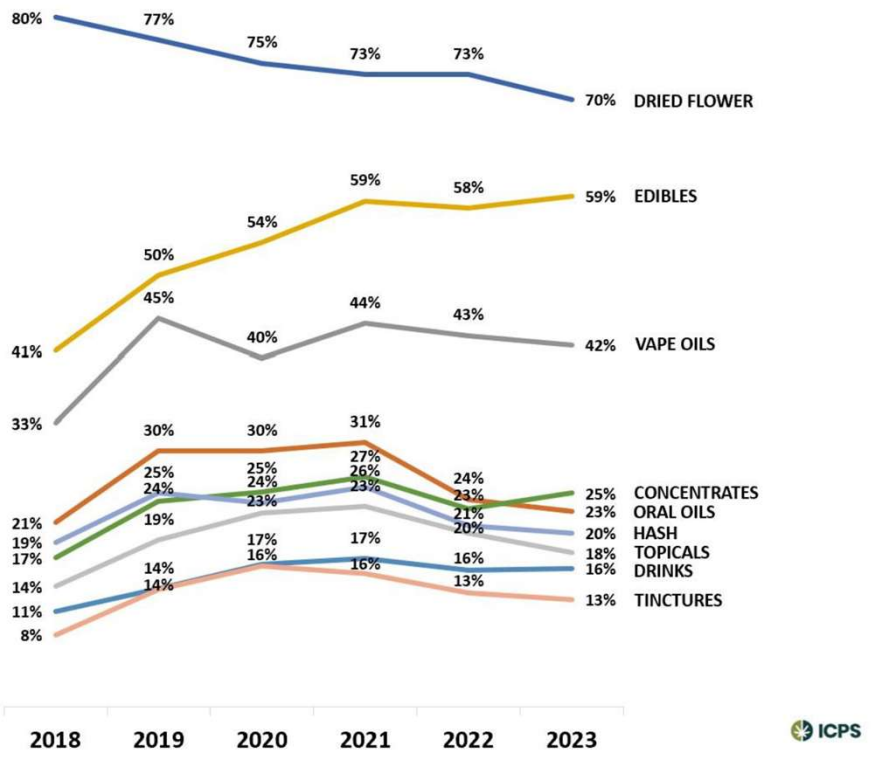
Blanchette JG, Pacula RL, Smart R, Lira MC, Pessar SC, and TS Naimi. (2022). "The Cannabis Policy Scale: A New Research and Surveillance Tool for U.S. States." *Journal of Studies on Drugs and Alcohol*. 83(6): 829-838.

Aspects of regulation that get insufficient attention in the U.S. market

1. **Product regulation**
   - Which products are available
   - What potencies
   - Mixed with what ingredients
   - In what delivery devices

2. Marketing and promotion of cannabis products

3. Retailer exposure (in terms of marketing, not availability)



Types of cannabis products used among individuals reporting use of cannabis in the past year in the United States, International Cannabis Policy Study, 2018–2023 (N = 64,054).
SOURCE: Generated by David Hammond, consultant to the committee.

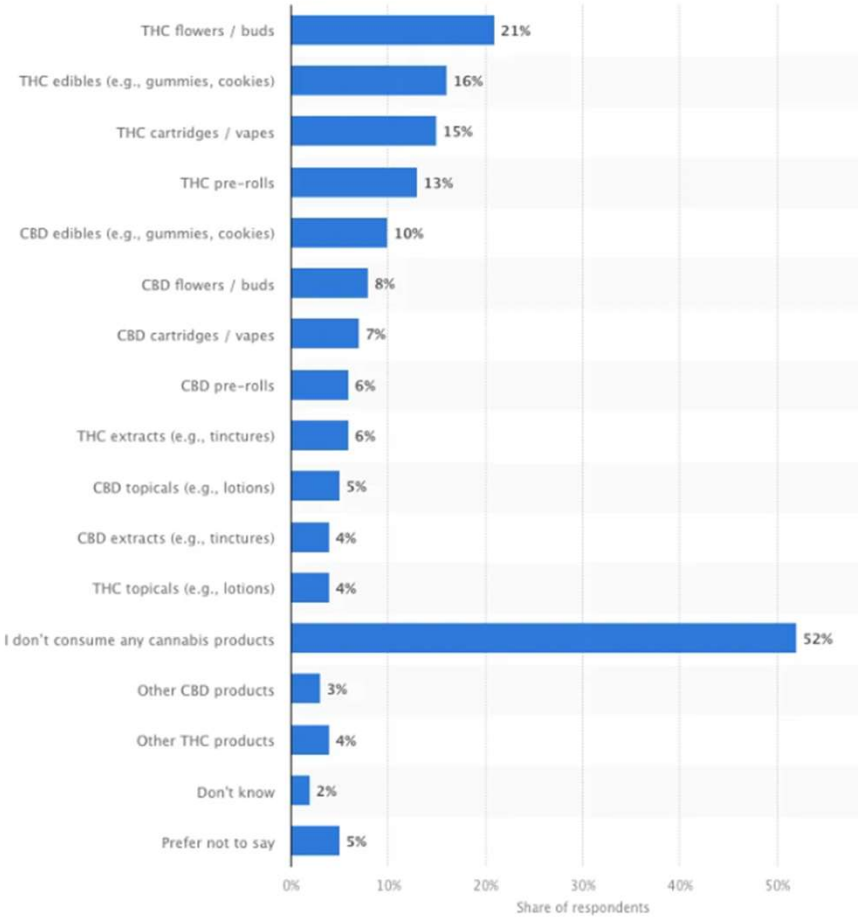
Data from the cannabis industry tells a different story

- CBD flower + THC flower/buds + pre-rolls =48% of the market
- Edibles: THC + CBD =26% of the market
- Vapes: THC + CBD =22% of the market

So:

- Vapes + edibles = flower/bud and pre-rolls
- Typical potency of cannabis vape in U.S. market =60%- 80% THC
- Typical potency of cannabis flower =25% THC

Usage of Cannabis Products in the U.S. as of September 2024



Aspects of regulation that get insufficient attention in the U.S. market

1. Product regulation

2. **Marketing and promotion of cannabis products**

3. Retailer exposure (in terms of marketing, not availability)

From the cannabis industry news source **MJBizDaily**, reported earlier this year (4/2/2025): "Beyond THC levels, branding, packaging and promotions heavily influence consumer choices."

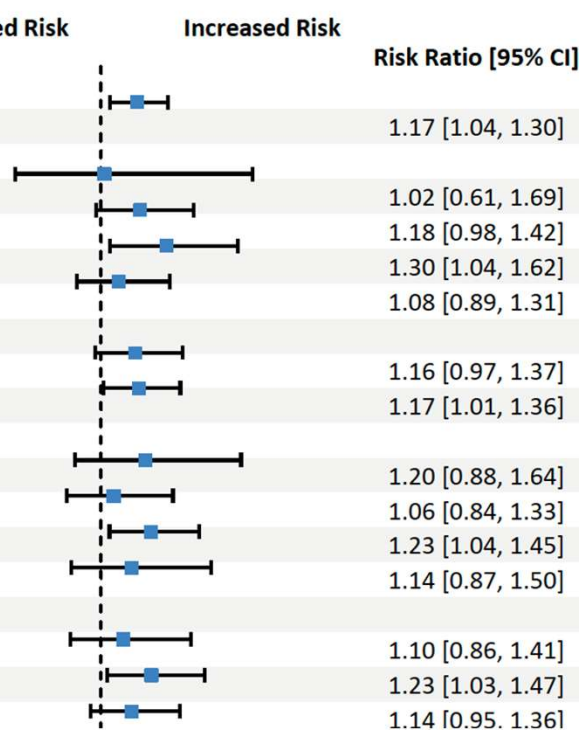
From **NASEM Report**: "In many states there are clear violations of laws on sales of youth-oriented products (Luc et al., 2020) and on promotion of cannabis products to youth (Cui et al., 2023; Krauss et al., 2017), as well as violations on marketing rules, including posting health claims (Berg et al., 2023; Shi and Pacula, 2021). "

Evidence on harmful effects of advertising / promotion: Cannabis-Involved ED visit on 4/20 vs 4/13 and 4/27

4/20 experiences 17% greater odds of an cannabis-involved ED visit than the week before and the week after

Same result when we take out Covid years

Subgroup	4/20	Average of 4/13 & 4/20	Risk Ratio [95% CI]
Total	663	568.5	1.17 [1.04, 1.30]
Age, y			
0-15	30	29.5	1.02 [0.61, 1.69]
16-24	240	203.5	1.18 [0.98, 1.42]
25-35	180	138.5	1.30 [1.04, 1.62]
36-64	213	197	1.08 [0.89, 1.31]
Sex			
Male	285	246.5	1.16 [0.97, 1.37]
Female	378	322	1.17 [1.01, 1.36]
Region of the U.S.			
Northeast	89	74	1.20 [0.88, 1.64]
Midwest	154	145.5	1.06 [0.84, 1.33]
South	311	253.5	1.23 [1.04, 1.45]
West	109	95.5	1.14 [0.87, 1.50]
Diagnosis associated with ED visit			
Gastrointestinal	134	121.5	1.10 [0.86, 1.41]
Mental Health	267	217	1.23 [1.03, 1.47]
Other	262	230	1.14 [0.95, 1.36]



Lin, K., Jena, A. B., Pacula, R. L., Huskamp, H. A., & Mehrotra, A. (2025). Cannabis April 20th Celebration and Related Emergency Department Visits. JAMA Network Open, 8(5), e2511635-e2511635.

Aspects of regulation that get insufficient attention in the U.S. market

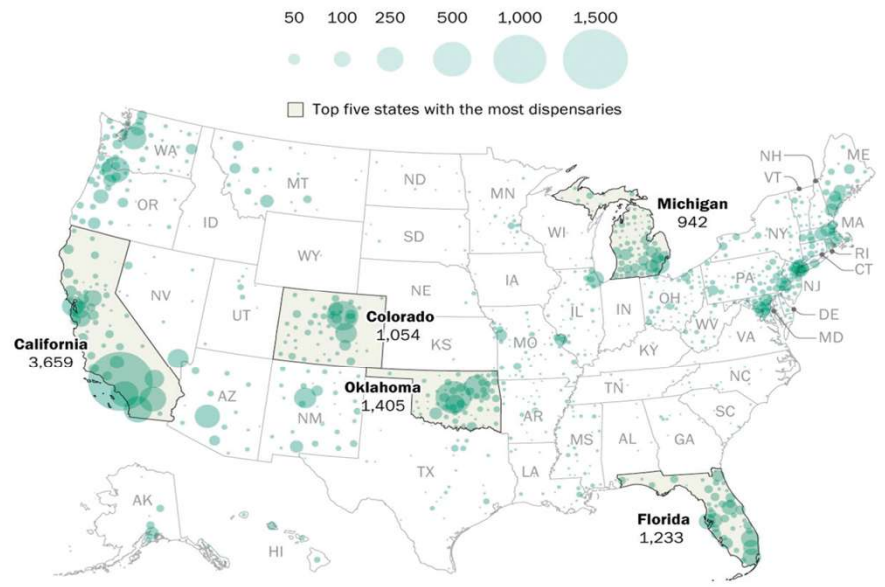
1. Product regulation

2. Marketing and promotion of cannabis products

3. **Retailer exposure** (in terms of marketing, not availability)

Cannabis dispensaries are common along the coasts and in a few specific states

Number of cannabis dispensaries in each county

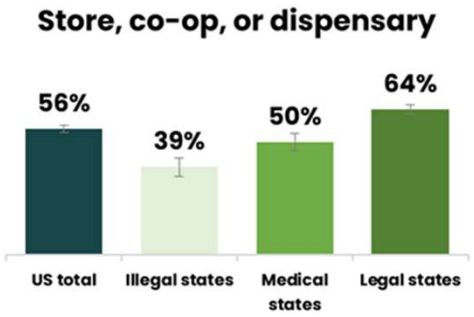


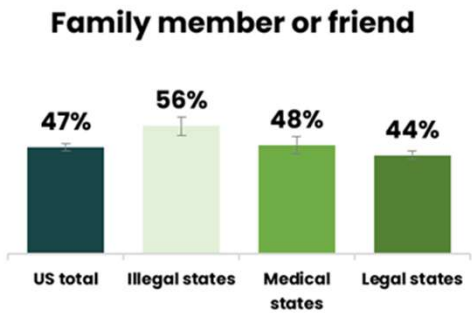
Note: Includes dispensaries that sell cannabis for both recreational and medical purposes, as well as those selling cannabis products containing low amounts of THC or CBD-only products.

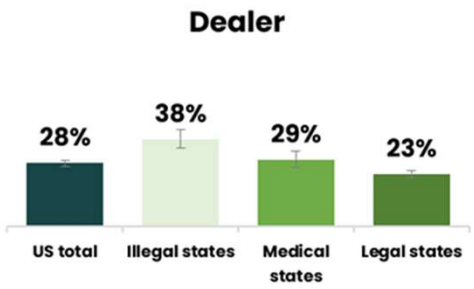
FIGURE 1-2 Map of cannabis retailers.
NOTES: SafeGraph curates information about millions of places of interest around the globe (https://www.safegraph.com [accessed March 24, 2024]). The Pew analysis includes those retail outlets that sell cannabis (including low-THC cannabis products) for medical or adult use but does not include outlets selling cannabis products marketed as "hemp" or "derived from hemp." CBD = cannabidiol; THC = delta-9-tetrahydrocannabinol.
SOURCE: Chapekis and Shah, 2024, Pew Research Center analysis of cannabis retail store locations from SafeGraph.

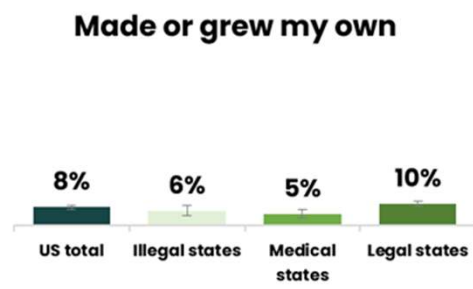
Where do people get their cannabis?

- **As of 2023, more people report getting cannabis in the US from a legal store than any other source.**









Source: International Cannabis Policy Study data prepared for NASEM Report (2024)

My main takeaways:

- Clear evidence that cannabis legalization has increased cannabis prevalence rates among adults, as well as cannabis use disorder, among youth and adults.

- Uncertainty with respect to other key questions is due to slow availability of key data necessary for providing definitive effects at a population level.

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Thank you!

Extra Slides

2020 study shows fewer than 202 studies examining health outcomes had known THC concentration

AJPH RESEARCH & ANALYSIS

Health Effects of High-Concentration Cannabis Products: Scoping Review and Evidence Map

Lisa Bero, PhD, Rosa Lawrence, BA, Jean-Pierre Oberste, BA, Tianjing Li, MD, PhD, MHS, Louis Leslie, BA, Thanitsara Rittiphairoj, MD, MPH, Christi Piper, MLIS, George Sam Wang, MD, Ashley Brooks-Russell, PhD, MPH, Tsz Wing Yim, MPH, Gregory Tung, PhD, MPH, and Jonathan M. Samet, MD, MS

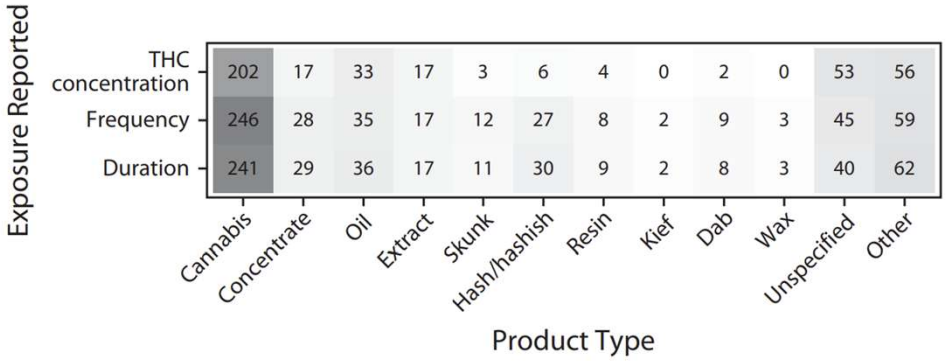
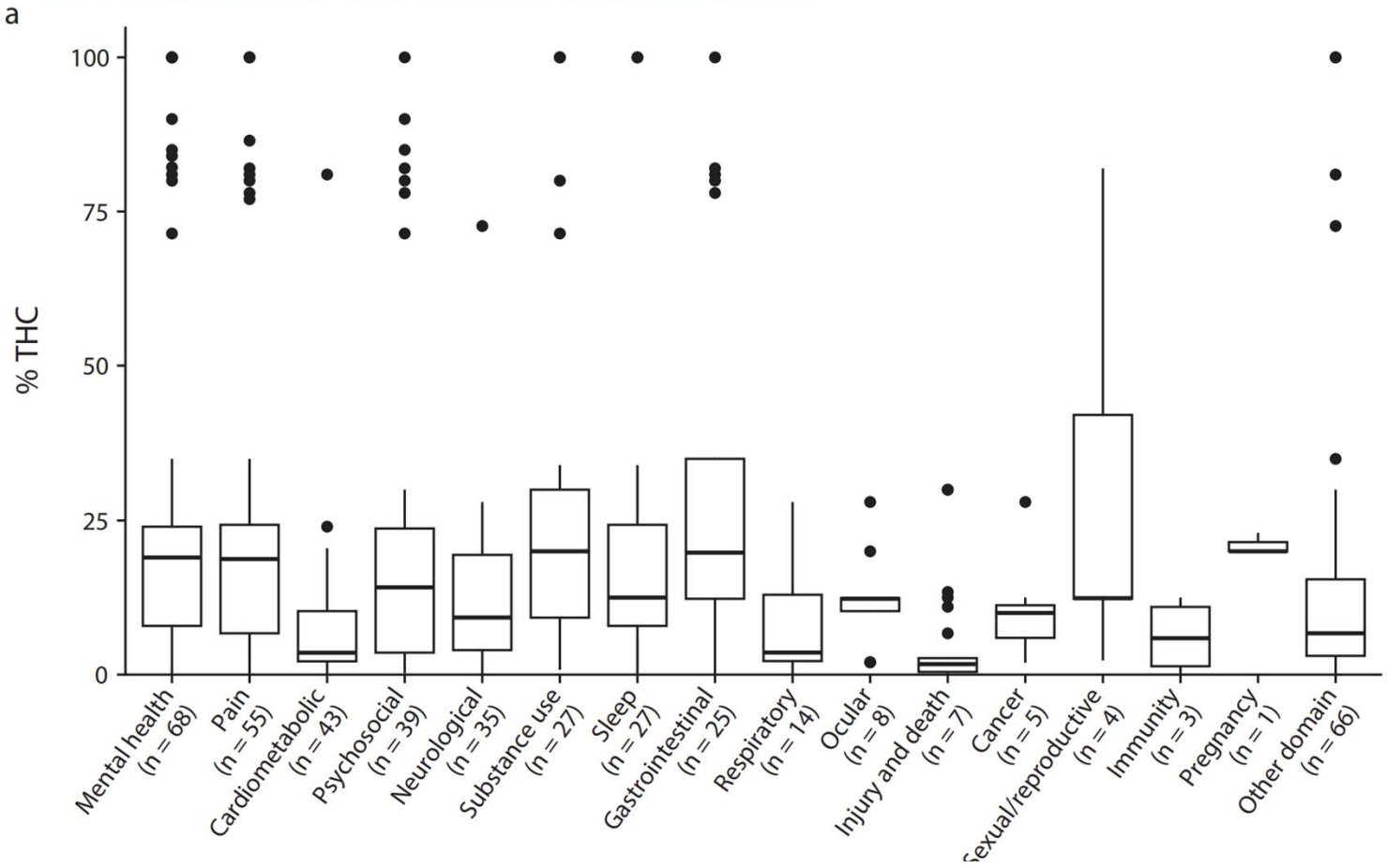


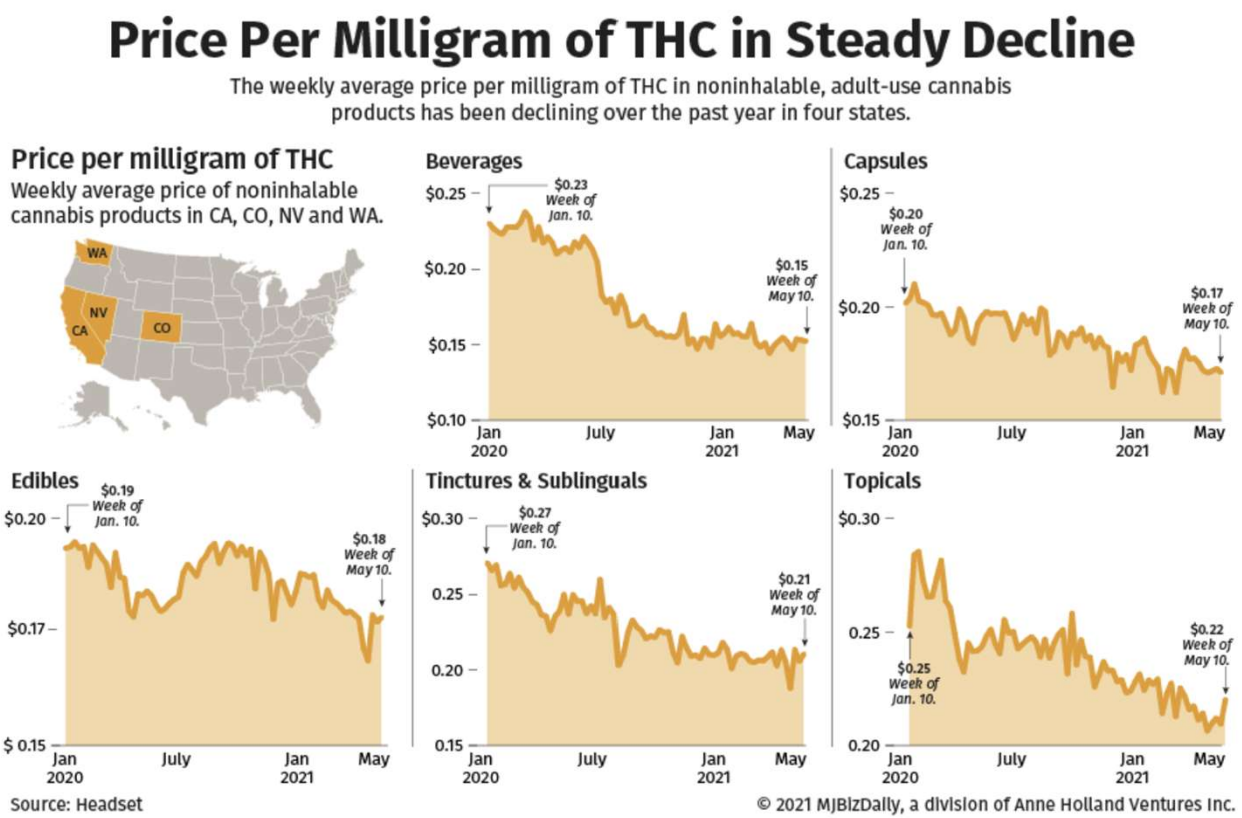
FIGURE 2— Number of Studies With Reported THC Concentration, Frequency, or Duration of Cannabis Use by Cannabis Product Type in Health Effects of High-Concentration Cannabis Products: Scoping Review and Evidence Map

Vast majority of those studies considered concentrations well below those currently available in U.S. markets



Source: Bera et al (2023) "Health Effects of High-concentration Cannabis Products: Scoping Review and Evidence Map. American Journal of Public Health 113 (12):1332-1342

Price per milligram of THC is declining across all products



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Other companies comparable in size to the U.S. state cannabis business:

	Retail Sales in 2024 (Billions)
U.S. Cannabis Industry:	> $35 .0
Curaleaf	$3.13
Eli Lilly	$34.12
Starbucks	$35.98
Philip Morris Int'l	$35.17
Qualcomm	$35.82
Uber Technologies	$37.28
Source: EQVISTA	

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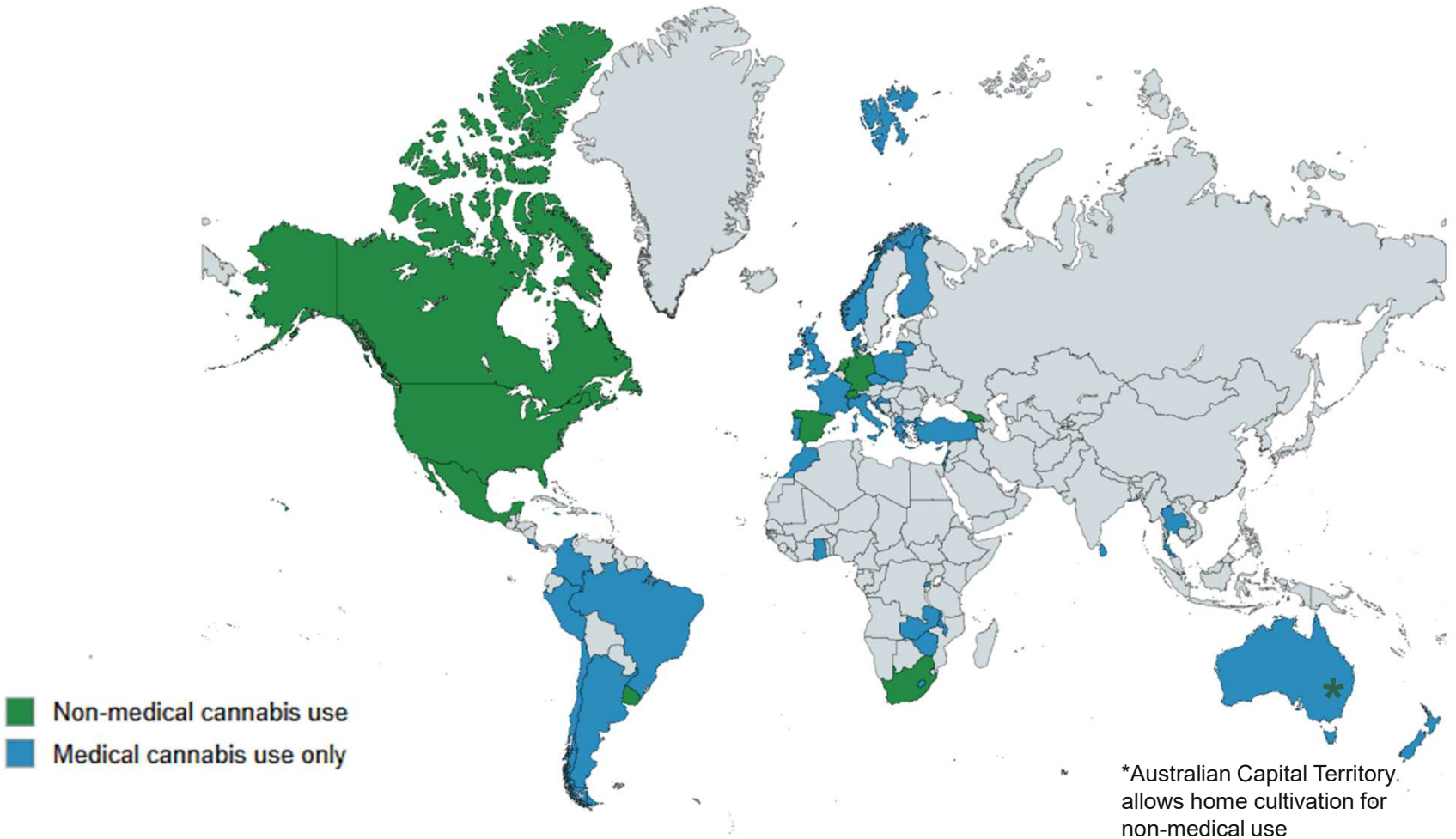
Cannabis Legalization in the United States and Abroad: Legalization's Impacts on Use

Rosalie Liccardo Pacula
Sol Price School of Public Policy
Leonard D. Schaeffer Center for Health Policy & Economics
University of Southern California

Global medical and non-medical cannabis policies (Jan 2025)

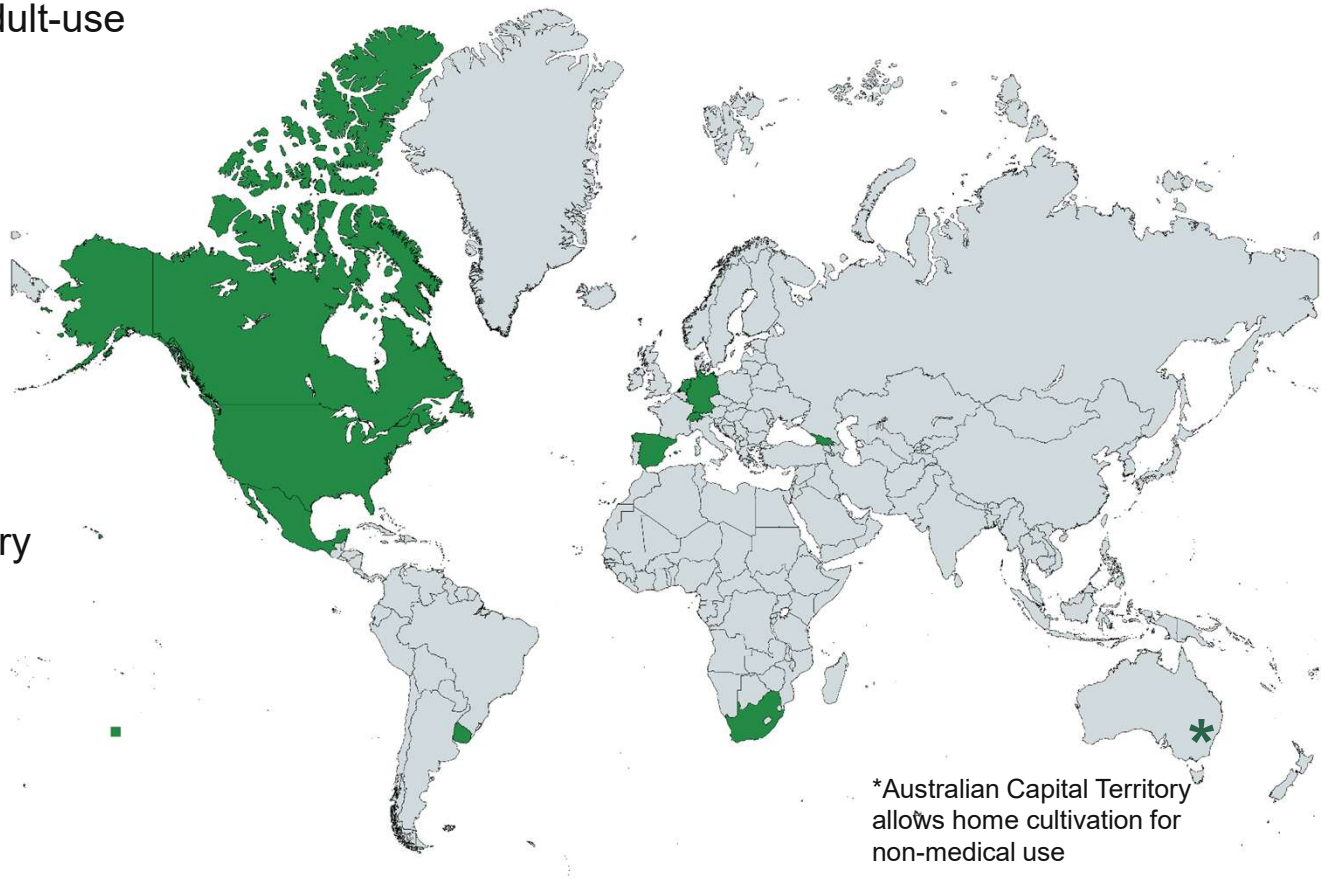


*Australian Capital Territory allows home cultivation for non-medical use

Global non-medical cannabis policy liberalization (Jan 2025)

Countries with some form of adult-use liberalization, beyond decriminalization

- US States
- Canada
- Uruguay
- Malta
- Germany
- South Africa
- Luxembourg
- Mexico
- Australian Capital Territory
- Spain
- Georgia
- Switzerland
- The Netherlands



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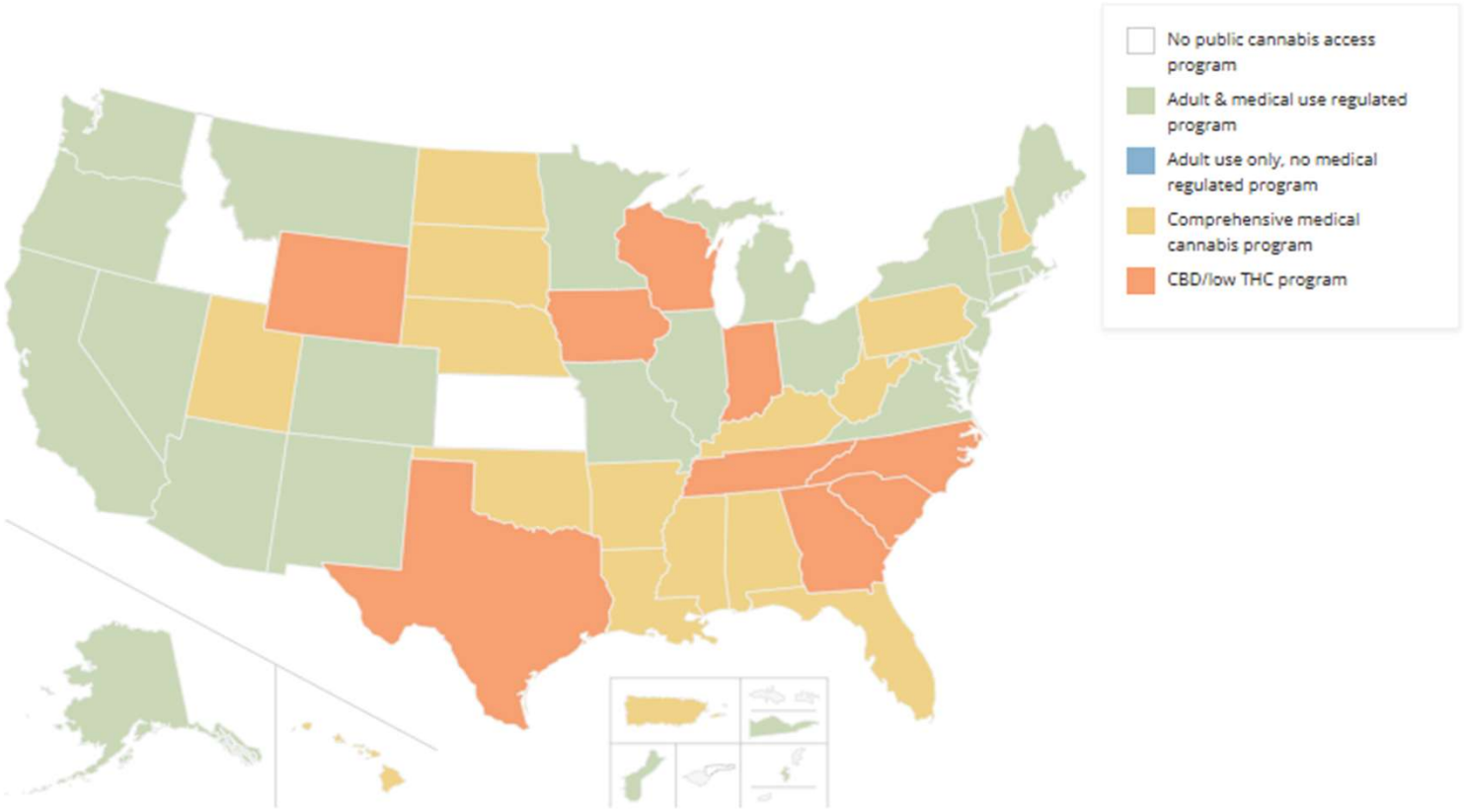
State Cannabis Policies as of June 2025

Cannabis is now legal for medical or adult use in more than three-quarters of the US states

Farm Bill of 2018 legalized hemp, so intoxicating CBD products also available in most states



NOTES: CBD = cannabidiol; THC = delta-9-tetrahydrocannabinol. The map does not include state policies instituted in response to the 2018 Agriculture Improvement Act (PL-115-334).
SOURCE: National Conference of State Legislatures.

Lots of interest in understanding the impact of these policies on use

- There has been a general consensus in the literature that:
  - Legalization increases adult prevalence of cannabis use and daily use
  - Legalization/commercialization is associated with increases in cannabis use disorder
- But there has also been some very inconsistent findings:
  - Impact of legalization on youth cannabis use?
  - Impact of legalization on impaired driving / alcohol use?
- This is a difficult question to answer definitively due to:
  1) Different ways of measuring cannabis use
  2) Different ways to represent legal cannabis policies
  3) Different methods and data that are applied across studies, not all of which are designed for causal inference

Problem #1: Measuring demand using any single metric is Incomplete and our current measures are poor

- Prevalence of different types of users (lifetime, past year, past month, near daily, etc.) tells us little about quantity consumed, only people engaging in the market
  - Occasional users generally use less overall, but unclear if it is less at one point in time
  - More regular consumers use higher amounts on average
  - Near daily users use more frequently, but not necessarily greater overall amount as those who binge on the weekend
  - Prevalence of these users groups in any sample will tell different story about amount consumed

What we really care about is amount consumed, and mode(s) of administration

Cannabis (the plant):

- all plant material, buds only
- pre-roll (infused or non-infused)

Cannabis-infused products? (ml, mg, ounces)

What about hemp-based products?

What about THC and THC-like cannabinoids or synthetics?

Problem #2: We have failed to acknowledge the variation that exists across states and countries in important policy elements

- Legal cannabis markets look different in different countries

	Uruguay	Canada	US: California	US: Connecticut
Legalization looks different across different jurisdictions				
	Only cannabis plant can be sold and only in pharmacies potency is either **9%, 15% and < 20% THC** Alternative sources: Cannabis Social Club or home cultivation avg THC content unknown No other products legally allowed	Only flower allowed in first 18 months. Other products depend on province – two provinces do not allow edibles or vapes to be sold. THC levels in flower range: 15-30%, **average is 20-25% THC** Home cultivation allowed No mixing of cannabis and other products Cap THC per package to 10 mg	All cannabis products allowed; THC levels of flower range 18%-40%, **modal THC is 30% ;** vapes have THC potency > 90% Allows cannabis buyers clubs and home cultivation. No caps on cannabis potency or bans on flavorings Cap THC per serving to 10 mg (edibles) and cap THC per package to 100 mg	THC levels **capped at 30%** for flower, regard-less of bud or pre-roll. Vape pens and concentrates also capped at 60% unless pre-filled No cannabis buyers clubs. Home cultivation is allowed. Edibles capped at 5 mg/ serving; 100 mg/ package

In 2019, we convened an expert panel to identify and rank cannabis regulations most likely to reduce excess use, any youth use, and DUI

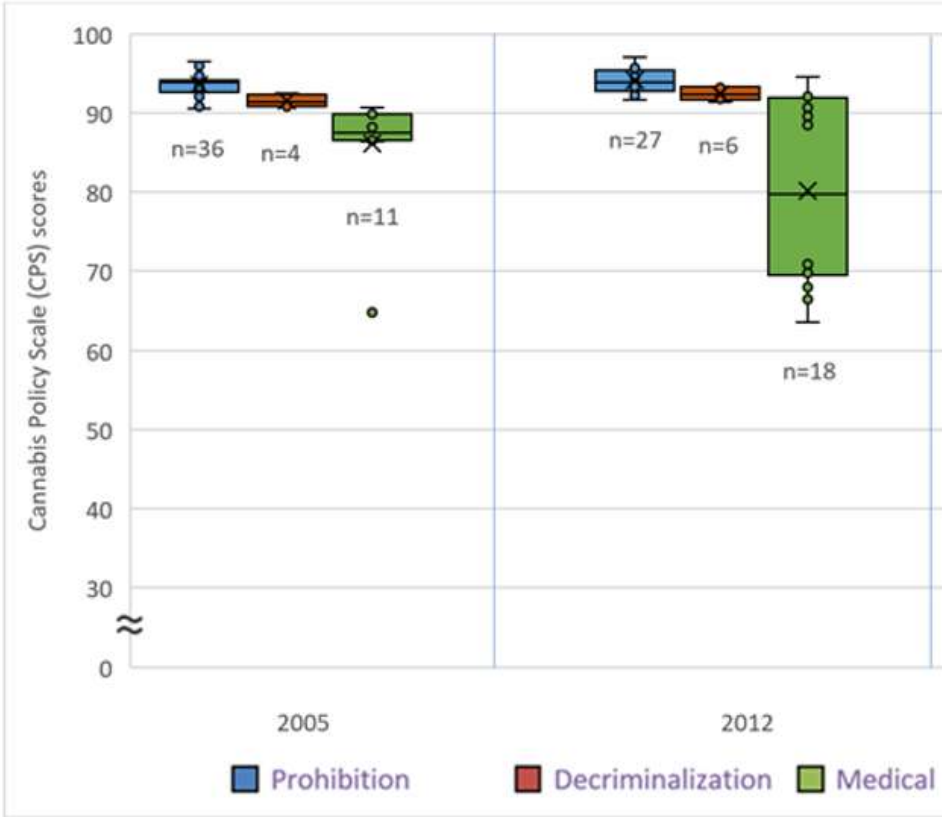
- We defined what we meant by cannabis policy: "Laws, regulations, and practices used to influence cannabis consumption which might include the presence or absence of supporting legislation, and/or operational aspects that reflect their implementation, enforcement, or resource allocation at the state level."
- We tracked these laws across all 50 states and based on implementation and perceived effectiveness computed a policy scale.

Blanchette, J. G., Pacula, R. L., Smart, R., Lira, M. C., Boustead, A. E., Caulkins, J. P., Kerr W., Kilmer B., Kleiman M, Treffers R & Naimi, T. S. (2022). Rating the comparative efficacy of state-level cannabis policies on recreational cannabis markets in the United States. *Int' Journal of Drug Policy*, 106, 103744.

1. Advertising Restrictions
2. Cannabis Possession Limits
3. Clean Air and Smoke Free Laws
4. Cultivation and Manufacturing Operations Restrictions and Requirements
5. Delivery Restrictions to Consumers
6. Home Cultivation Restrictions
7. Impaired Driving Laws
8. MC Restrictions and Requirements
9. Packaging and Labeling Restrictions and Requirements
10. Penalties for Adults who Possess Cannabis for Personal Use
11. Physical Retail Availability Restrictions
12. Product Design Restrictions and Requirements
13. Retail Price Restrictions
14. Retail Operations
15. State Monopoly
16. Taxes
17. Track-and-trace Requirements
18. Youth Policies

Big variation across states captured by CPS not reflected in simple dichotomous measuresof type of cannabis policy

Legalized states vary in their approaches to regulating cannabis as reflected in the Cannabis Policy Scale, which summarizes implementation of 18 different areas of regulation across the states, and then weights them on expected efficacy for reducing excess use



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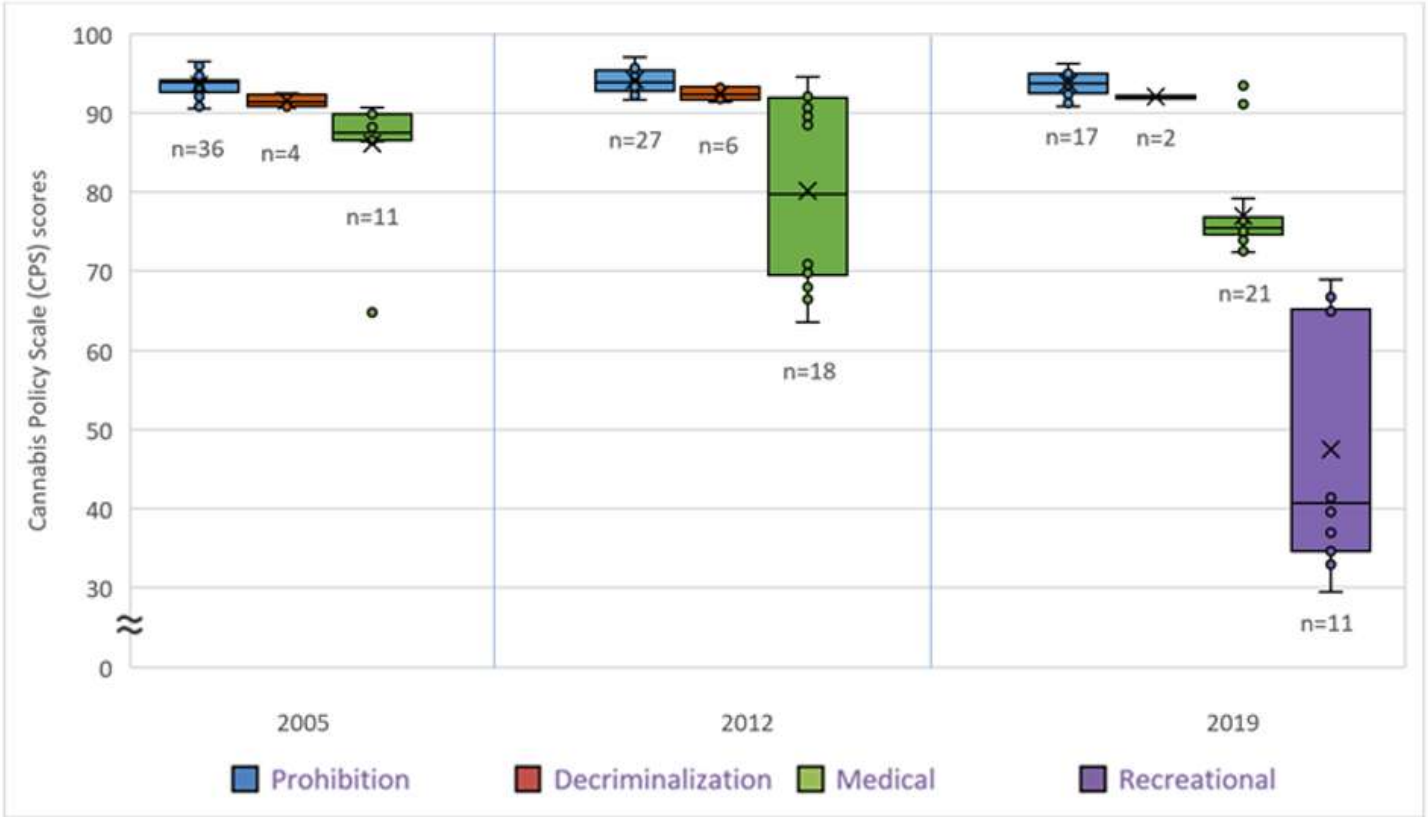

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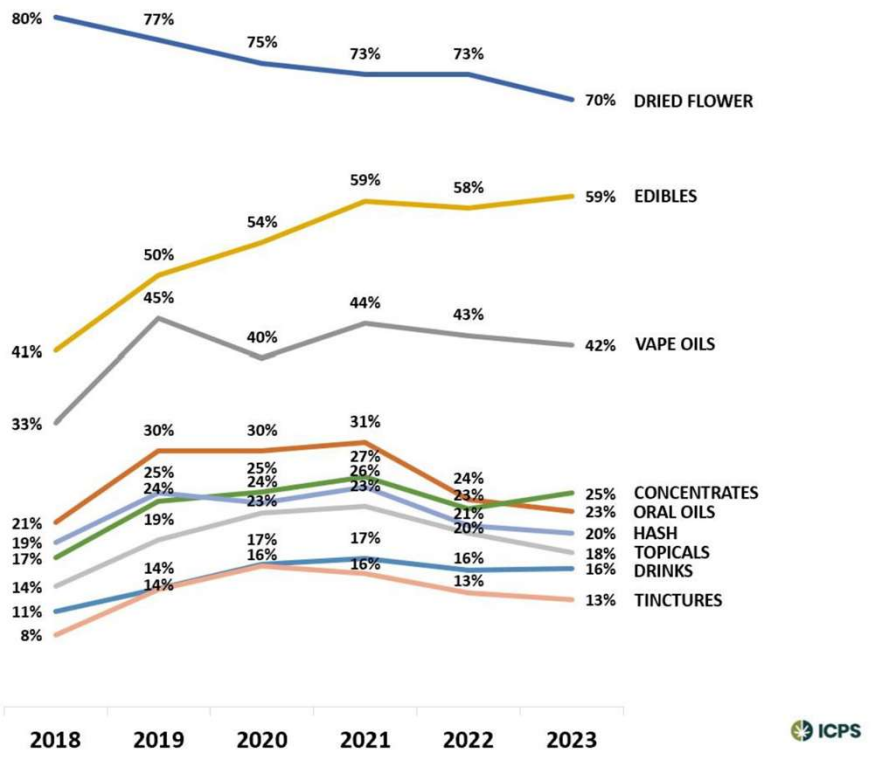
Aspects of regulation that get insufficient attention in the U.S. market

1. **Product regulation**
   - Which products are available
   - What potencies
   - Mixed with what ingredients
   - In what delivery devices

2. Marketing and promotion of cannabis products

3. Retailer exposure (in terms of marketing, not availability)



Types of cannabis products used among individuals reporting use of cannabis in the past year in the United States, International Cannabis Policy Study, 2018–2023 (N = 64,054).
SOURCE: Generated by David Hammond, consultant to the committee.

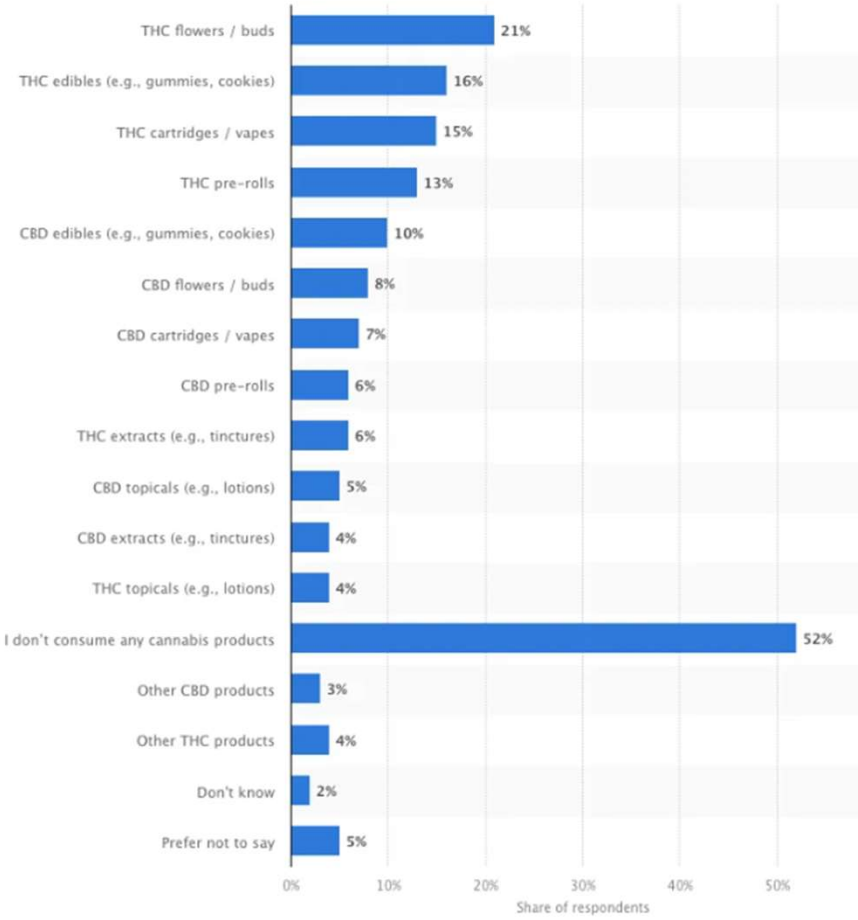
Data from the cannabis industry tells a different story

- CBD flower + THC flower/buds + pre-rolls =48% of the market
- Edibles: THC + CBD =26% of the market
- Vapes: THC + CBD =22% of the market

So:

- Vapes + edibles = flower/bud and pre-rolls
- Typical potency of cannabis vape in U.S. market =60%- 80% THC
- Typical potency of cannabis flower =25% THC

Usage of Cannabis Products in the U.S. as of September 2024



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From the cannabis industry news source **MJBizDaily**, reported earlier this year (4/2/2025): "Beyond THC levels, branding, packaging and promotions heavily influence consumer choices."

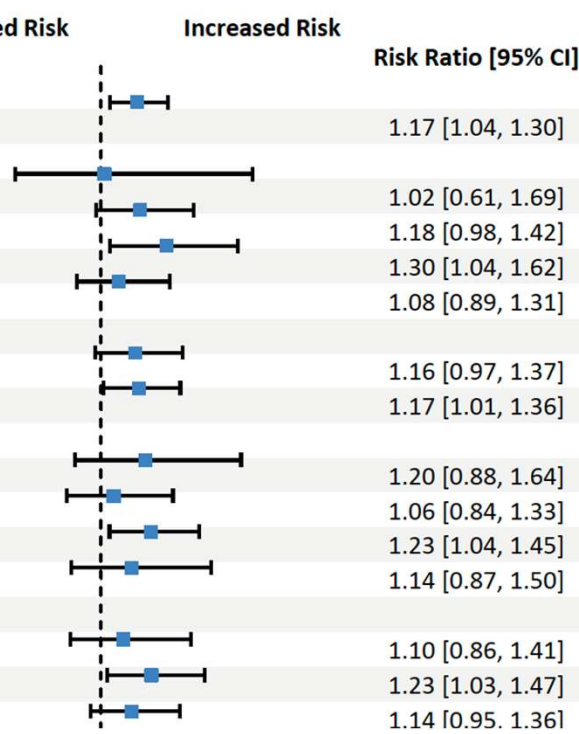
From **NASEM Report**: "In many states there are clear violations of laws on sales of youth-oriented products (Luc et al., 2020) and on promotion of cannabis products to youth (Cui et al., 2023; Krauss et al., 2017), as well as violations on marketing rules, including posting health claims (Berg et al., 2023; Shi and Pacula, 2021). "

Evidence on harmful effects of advertising / promotion: Cannabis-Involved ED visit on 4/20 vs 4/13 and 4/27

4/20 experiences 17% greater odds of an cannabis-involved ED visit than the week before and the week after

Same result when we take out Covid years

Subgroup	4/20	Average of 4/13 & 4/20	Risk Ratio [95% CI]
Total	663	568.5	1.17 [1.04, 1.30]
Age, y			
0-15	30	29.5	1.02 [0.61, 1.69]
16-24	240	203.5	1.18 [0.98, 1.42]
25-35	180	138.5	1.30 [1.04, 1.62]
36-64	213	197	1.08 [0.89, 1.31]
Sex			
Male	285	246.5	1.16 [0.97, 1.37]
Female	378	322	1.17 [1.01, 1.36]
Region of the U.S.			
Northeast	89	74	1.20 [0.88, 1.64]
Midwest	154	145.5	1.06 [0.84, 1.33]
South	311	253.5	1.23 [1.04, 1.45]
West	109	95.5	1.14 [0.87, 1.50]
Diagnosis associated with ED visit			
Gastrointestinal	134	121.5	1.10 [0.86, 1.41]
Mental Health	267	217	1.23 [1.03, 1.47]
Other	262	230	1.14 [0.95, 1.36]



Lin, K., Jena, A. B., Pacula, R. L., Huskamp, H. A., & Mehrotra, A. (2025). Cannabis April 20th Celebration and Related Emergency Department Visits. JAMA Network Open, 8(5), e2511635-e2511635.

Aspects of regulation that get insufficient attention in the U.S. market

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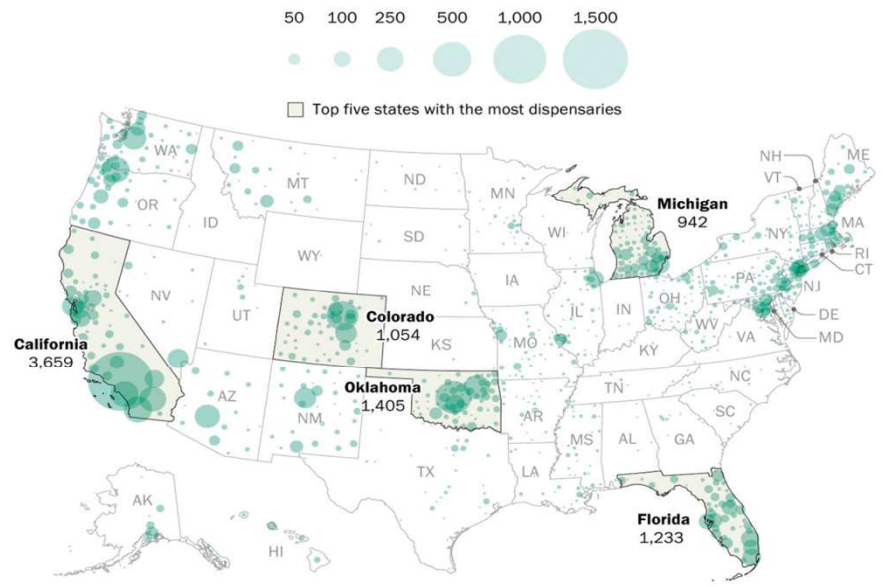
Cannabis dispensaries are common along the coasts and in a few specific states

Number of cannabis dispensaries in each county



Note: Includes dispensaries that sell cannabis for both recreational and medical purposes, as well as those selling cannabis products containing low amounts of THC or CBD-only products.

FIGURE 1-2 Map of cannabis retailers.
NOTES: SafeGraph curates information about millions of places of interest around the globe (https://www.safegraph.com [accessed March 24, 2024]). The Pew analysis includes those retail outlets that sell cannabis (including low-THC cannabis products) for medical or adult use but does not include outlets selling cannabis products marketed as "hemp" or "derived from hemp." CBD = cannabidiol; THC = delta-9-tetrahydrocannabinol.
SOURCE: Chapekis and Shah, 2024, Pew Research Center analysis of cannabis retail store locations from SafeGraph.

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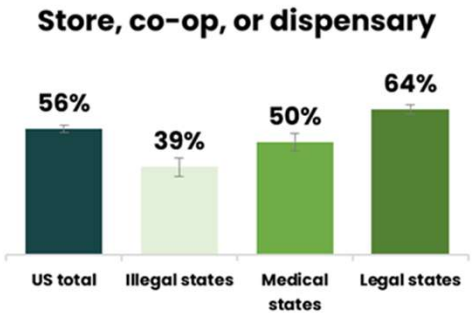

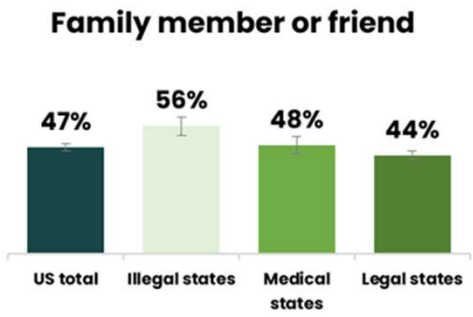

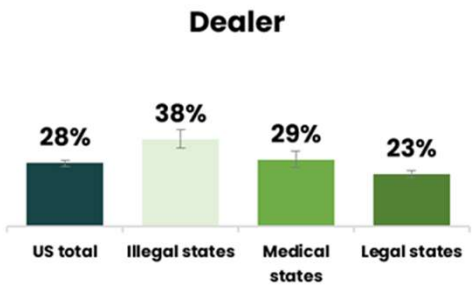

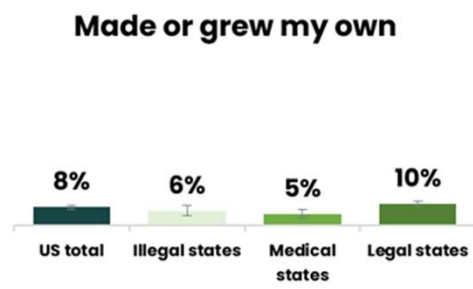

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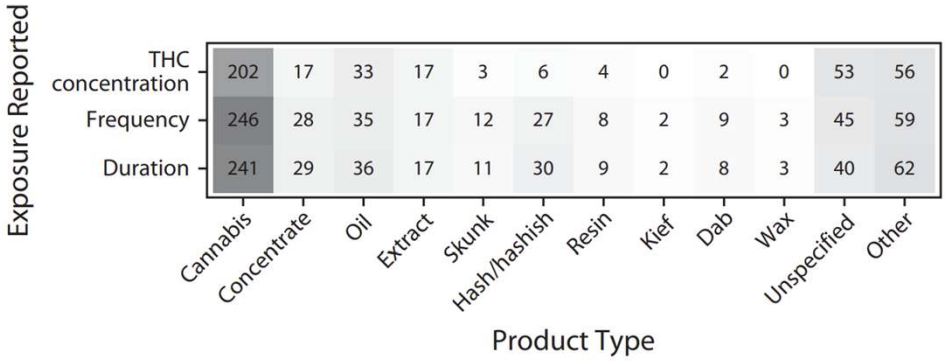

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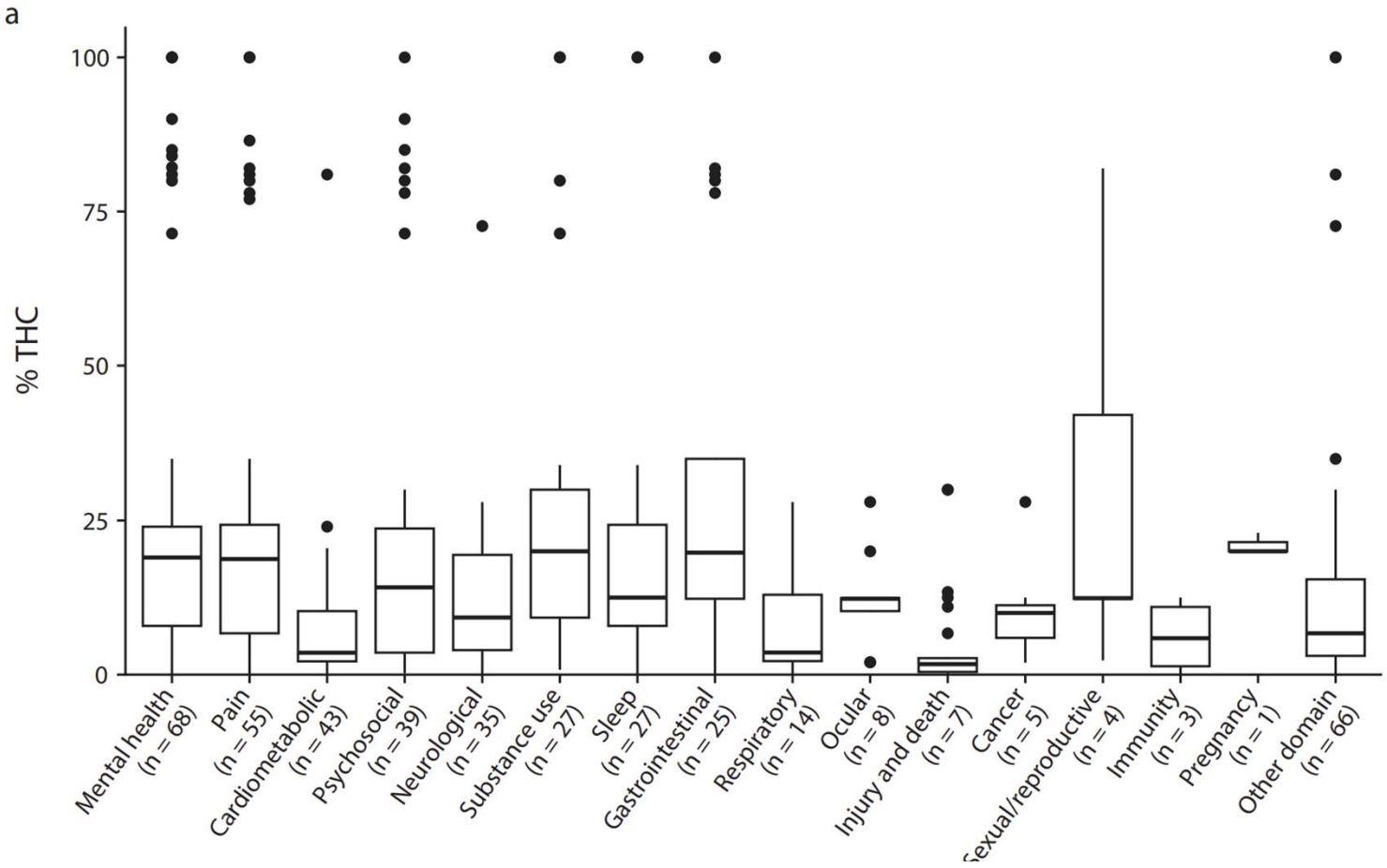

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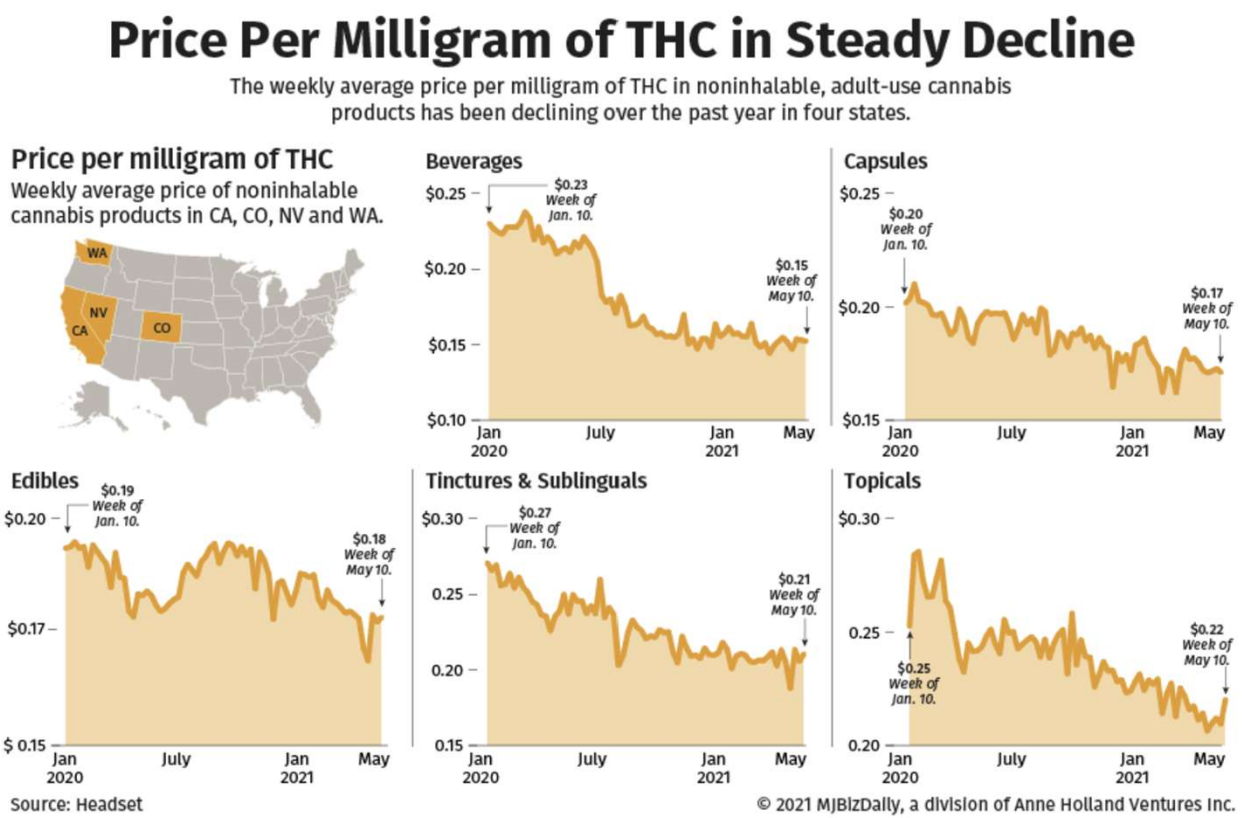

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