WELCOME to the *Cannabis in the Workplace: An ECHO on Health, Safety, and Management*

June 11 – August 29, 2025

Series Learning Objectives

After participating in this activity, learners will be able to:

1. Describe the potential impacts of cannabis on individual health and workplace health and safety
2. Recognize cannabis-related impairment and intervene to support health and safety in the workplace and the health of the involved individual
3. Describe legal and regulatory policies at state and national level that shape management of cannabis in the workplace
4. Develop and implement workplace policies related to cannabis that support health and safety

Series Sessions

Date	Session Title
6/11/2025	Pharmacology of cannabis and impact on individual
6/25/2025	Impact of cannabis on workplace
7/9/2025	Cannabis testing
7/23/2025	Assessing impairment in the workplace
8/6/2025	Intervention, management of leave, treatment, re-entry into the workplace
8/20/2025	The legal and regulatory landscape
8/27/2025*	Development of workplace policies

Core Panel

Bob McLellan, MD, MPH	Occupational Medicine Physician, Geisel School of Medicine
Charla Stevens, JD	Legal/ Regulatory Expert at Charla Stevens Consulting
Claire Bryant, MPH	Senior Program Manager, National Safety Council
Dana Lariviere	President/CEO at Chameleon Group
Jackie Pogue, MPH	Research Project Manager at Dartmouth College, Course Director
Jeanne Venuti, BS	Director of Workforce Development at Recovery Friendly Workplace
Liz Bailey, JD	Legal/ Regulatory Expert at Sheehan Phinney
Luke Archibald, MD	Section Chief, Addiction Treatment Program, Dartmouth Health
Seddon Savage, MD	Education Director, Project ECHO at Dartmouth Health

Cannabis Pharmacology and Actions
What Employers Need to Know

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6-2025

Disclosures

- I do not have any relevant financial disclosures

Objectives

- Discuss prevalence of cannabis use
- Describe reported reasons for therapeutic & recreational cannabis use
- Outline diversity of U. S. state laws for therapeutic & recreational cannabis use
- Describe cannabis pharmacology and routes of administration
- Discuss cannabis risks, side effects and impact on work performance

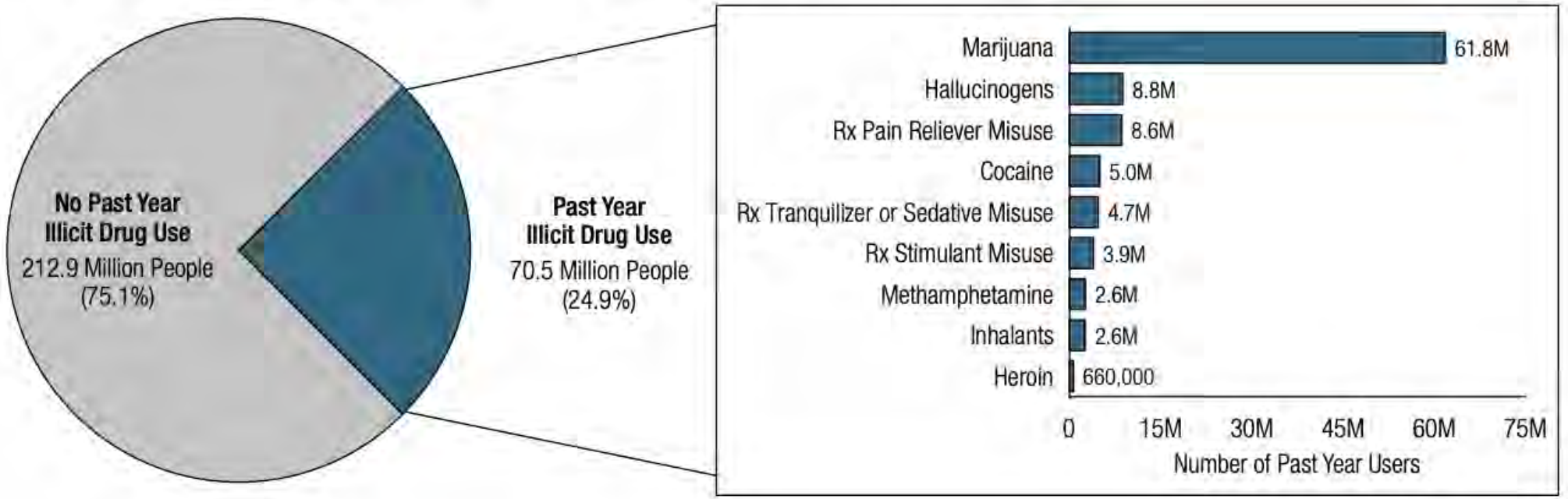
Cannabis has been in use for centuries

- 4000 B.C use China
- 450-200 B.C. Greco-Roman Use
- 1000 – 1464 A.D. Treatment for epilepsy
- 1850 U.S. Pharmacopeia -neuralgia, opioid addiction, alcoholism
- 1937 Marihuana Tax Act; Federal prohibition
- 1942 Removed from U. S. Pharmacopeia
- 1964 THC discovered
- 1970 CSA Schedule 1 (Recreational >> criminalization)
- 1988 CBD1 and CBD2 receptors discovered
- 2000 – present Increased therapeutic use > Push for legalization

https://www.deamuseum.org/ccp/cannabis/history.html; https://www.visualcapitalist.com/history-medical-cannabis-shown-one-giant-map

Cannabis Use in the U.S. 2023 Past year use

Figure 12. Past Year Illicit Drug Use: Among People Aged 12 or Older; 2023



Rx = prescription.

Note: The estimated numbers of past year users of different illicit drugs are not mutually exclusive because people could have used more than one type of illicit drug in the past year.

National Survey on Drug Use and Health, 2023
https://www.samhsa.gov/data/sites/default/files/reports/rpt47095/National%20Report/National%20Report/2023-nsduh-annual-national.pdfç

People use cannabis for a variety of reasons

- According to surveillance data 38% use for recreational, 33% for recreational and medical and 29% for medical only[1]
- Young adults' motives for cannabis use were enjoyment/fun, conformity, experimentation, social enhancement, and relaxation[2]
- College students reported using cannabis for social facilitation, peer acceptance, emotional pain, and sex-seeking[3]
- In a small Canadian study of long term users the top reason for use was **relaxation**; other reasons included feeling good, enjoyment of media, medical use, inspiration, depression, anxiety, better sleep, and boredom[4]

[1]Kurtzman & Wolff; *Drug Alcohol Depend;* 2021;226 https://doi.org/10.1016/j.drugalcdep.2021.108880; [2]Lee et al.. Addict Behav. 2007;;32(7):1384-94. doi: 10.1016/j.addbeh.2006.09.010. [3]Beck et alAddict Behav. 2009;34(9):764-8. doi: 10.1016/j.addbeh.2009.05.001; [4]Hathaway. *Addiction Research & Theory*, 2003;*11*(6), 441–458.

People use cannabis to self-treat symptoms

27,169 respondents to 2018 online survey in U.S and Canada

- Self-reported ever symptom management use (27%)
- Higher in legal use states (34%) versus illegal use states (23%)
- Among reported reasons for symptom management:

Physical symptoms

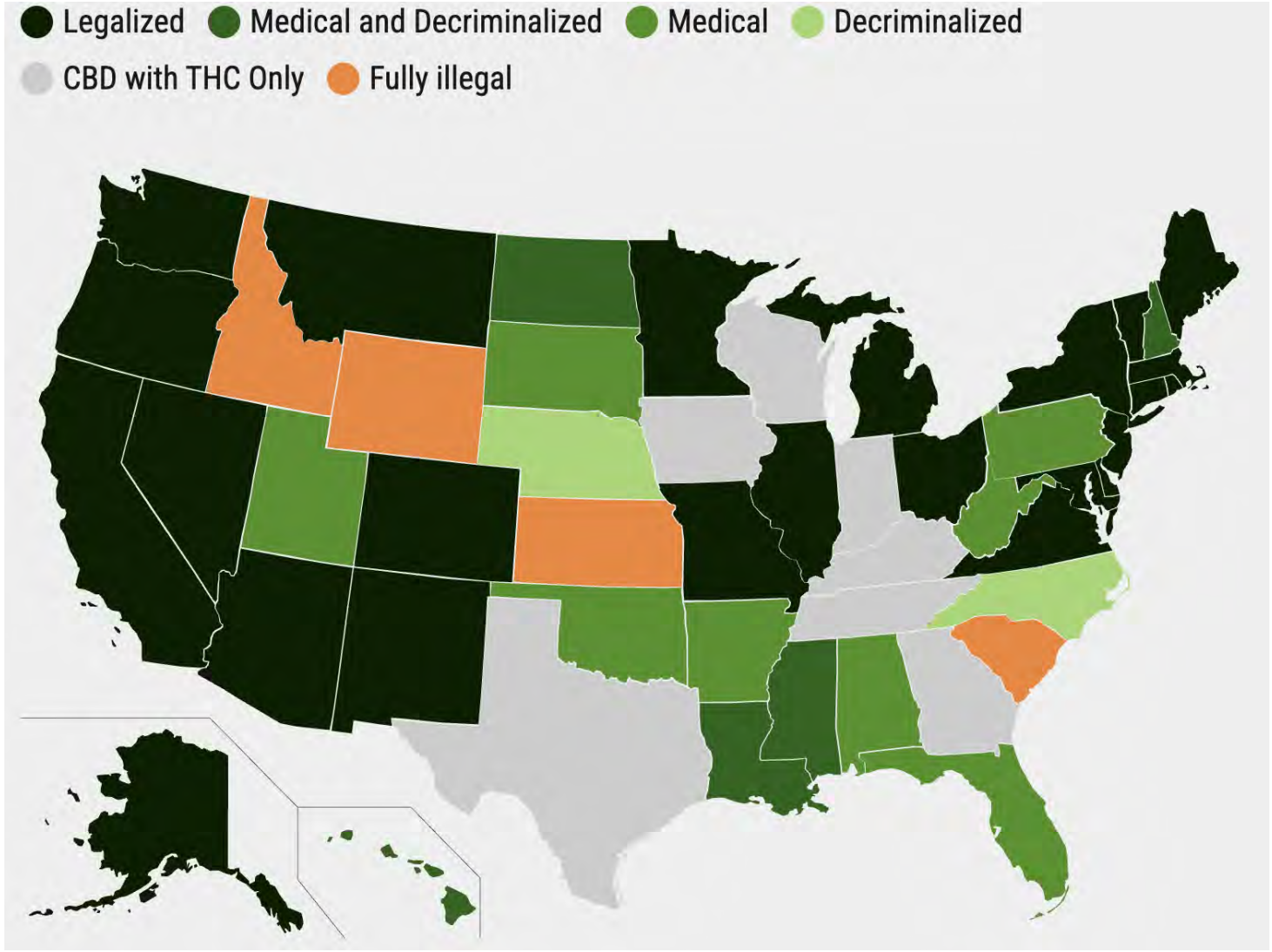
Pain 53%
Sleep 46%
Headaches 35%
Appetite 22%
N/V 21%

Mental health symptoms

Anxiety 52%
Depression 40%
PTSD/Trauma 17%
SUD 11%
Psychosis 4%

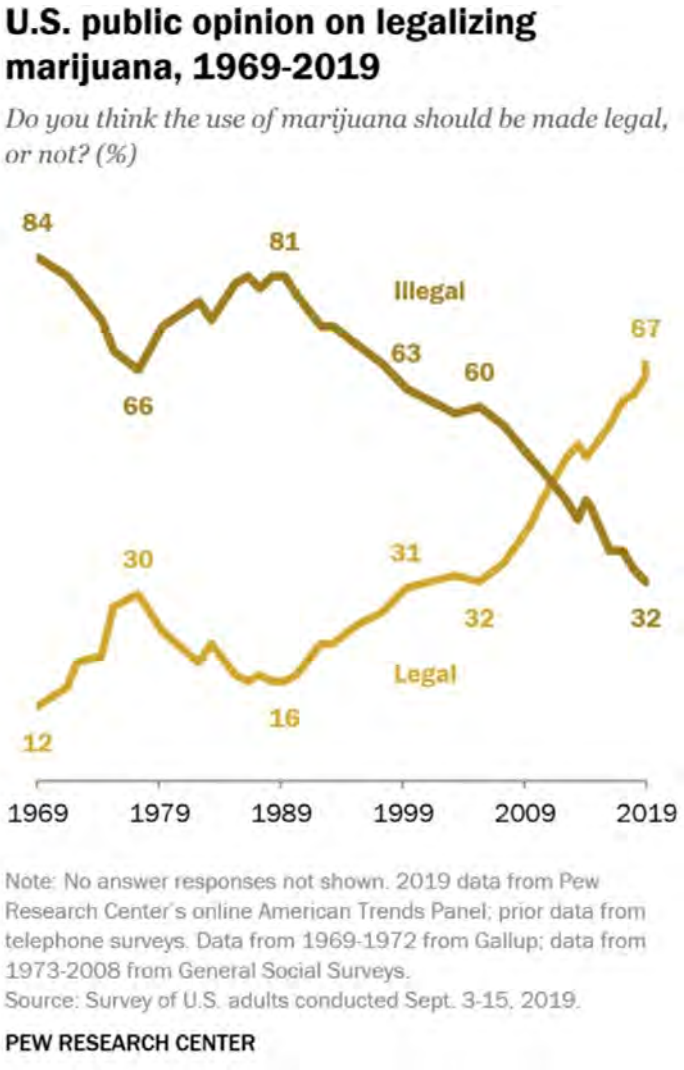
Leung et al . Psychopharmacology (Berl). 2022https://pmc.ncbi.nlm.nih.gov/articles/PMC9110511/

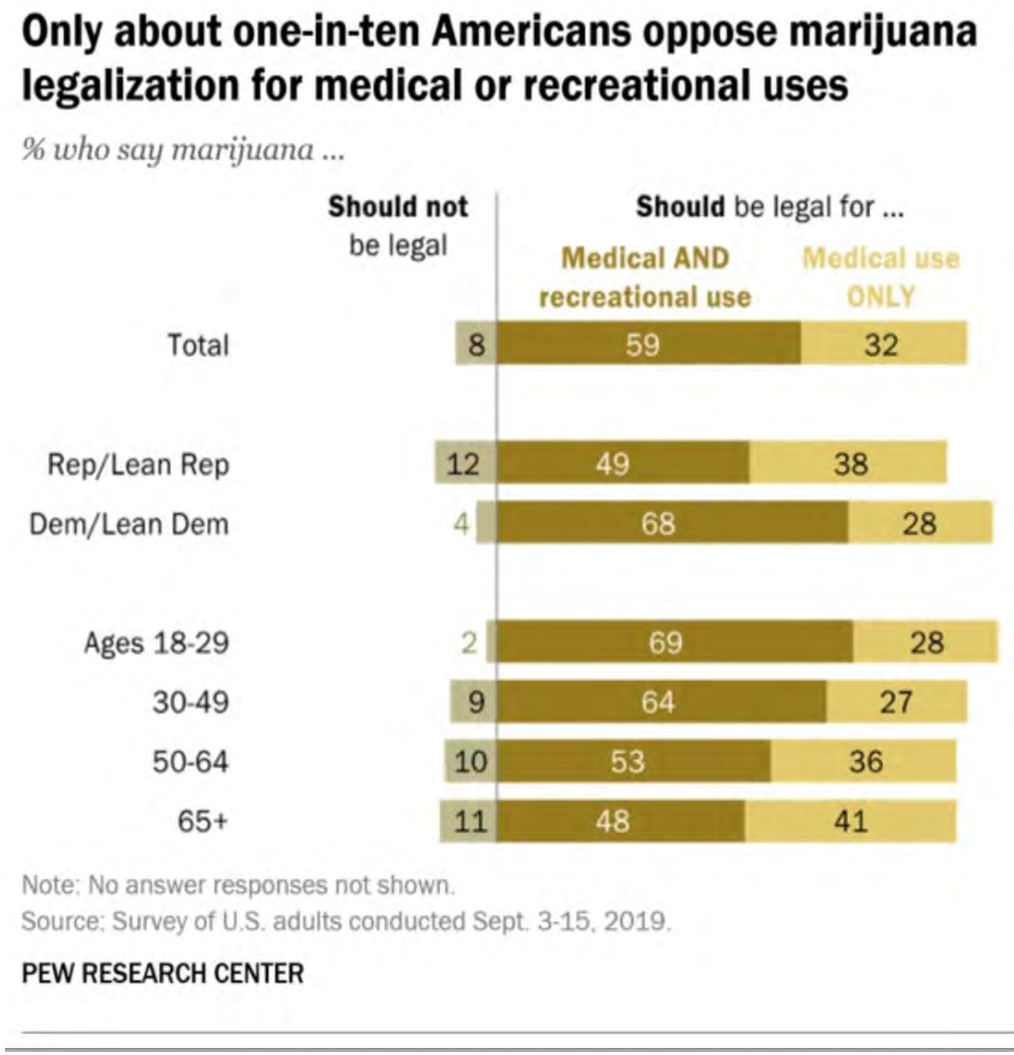
State cannabis policies are variable/changing



https://disa.com/marijuana-legality-by-state

Majority of Americans now support legalization of marijuana





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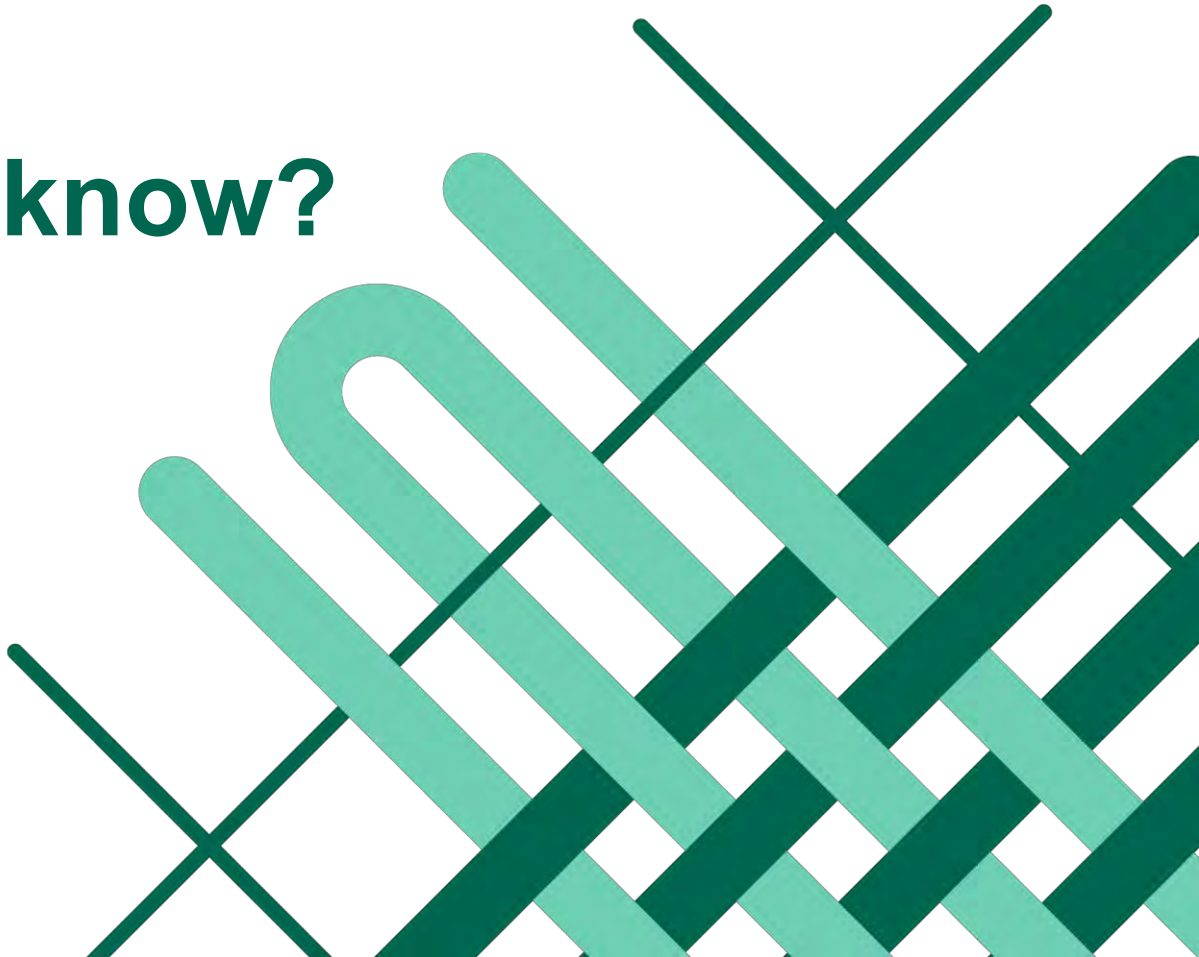
Cannabis – What do we know?



Cannabis contains > 100 phytocannabinoids and > 600 chemical constituents

- Two most prevalent cannabinoids
  - **Δ^9-tetrahydrocannabinol (THC)** - psychoactive; anti-emetic, analgesia, appetite stimulation (discovered 1964)
  - **Cannabidiol (CBD)** –not psychoactive; anti-convulsant, anxiolysis, anti-inflammatory
- Less studied cannabinoids & terpenes may contribute to effects
- NO standardization -Diverse strains bred and available
  - Very high THC concentrations are available
    - 1970s - 3-5% THC typical -Vape products > **94% THC available in dispensary**
  - Low THC, high CBD products and intermediate blends are available

Rock, Parker,. Adv Exp Med Biol. 2021;1264:1-13. doi: 10.1007/978-3-030-57369-0_1. PMID: 33332000.

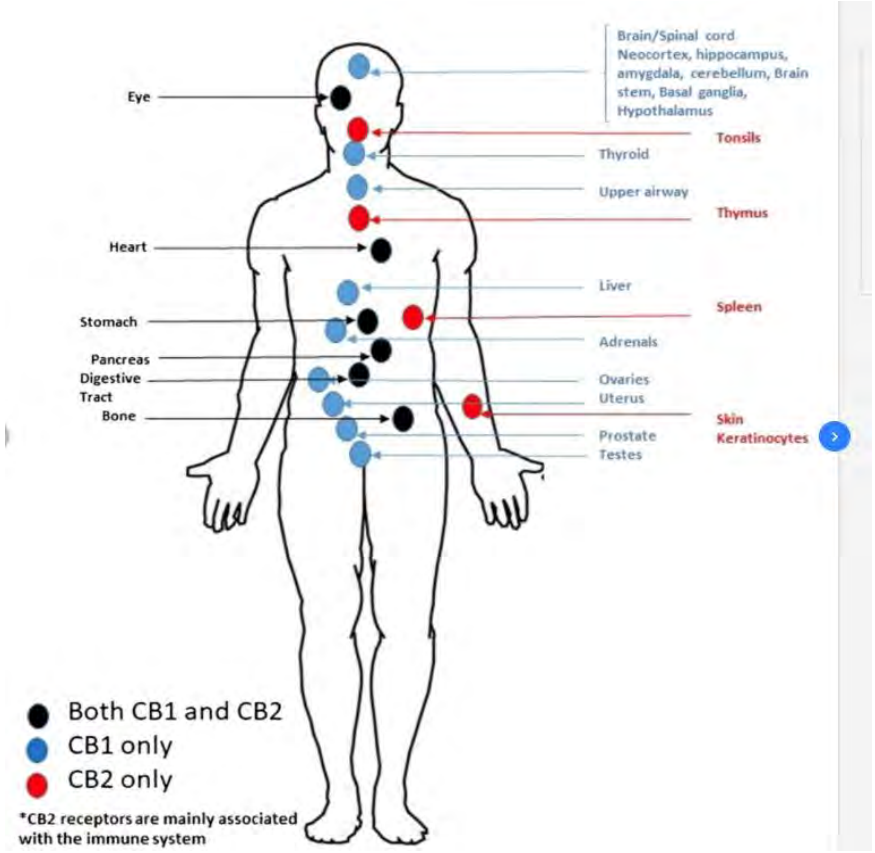
Endogenous cannabinoid system

Endocannabinoids bind to cannabinoid receptors to exert diverse physiologic effects

- CB1 (primarily in nervous system)
- CB2 (primarily in immune system)

Physiologic roles in

- Nociception (pain regulation)
- Mood modulation including reward
- Cognition, learning & memory
- Energy balance, appetite



Implications: Limited understanding of the effects of exogenous (external) cannabinoids (like THC/CBD) on endogenous (internal) cannabinoid system

Volkow et al. *Annu Rev Pharmacol Toxicol,* 2017;57:285-308; DiMarzo & Piscitelli, The Endocannabinoid System & Its Modulation by Phytocannabinoids, Neurotherapeutics, 2015

Three pharmaceutical cannabis products are available in the U. S.

Dronabinol
appetite loss HIV; CINV*

← Synthetic **THC** (1985) →

Nabilone
CINV*

CBD (2018) →

Epidiolex®
Seizures secondary to Lennox-Gastaut or Dravet syndrome

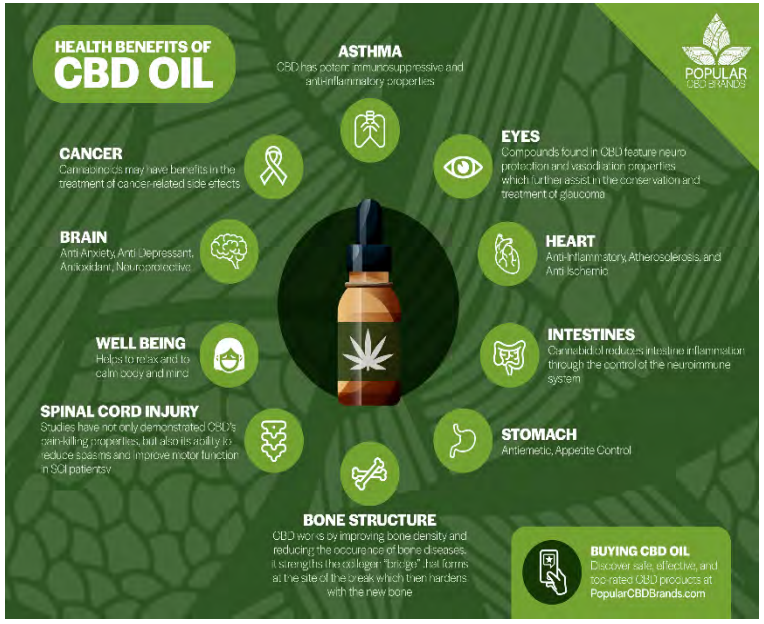
THC/CBD 1:1
Not approved US →

Nabiximols
MS** spasticity;
Off-label neuropathic pain

*CINV – chemotherapy induced nausea and vomiting; **MS multiple sclerosis

Cannabidiol (CBD) is widely available, but not well-regulated

Marketed indications not well studied



58 of 84 samples of CBD purchased online had mislabeled CBD content Bonn-Miller et al. *JAMA*. 2017;318 (17):1708-1709

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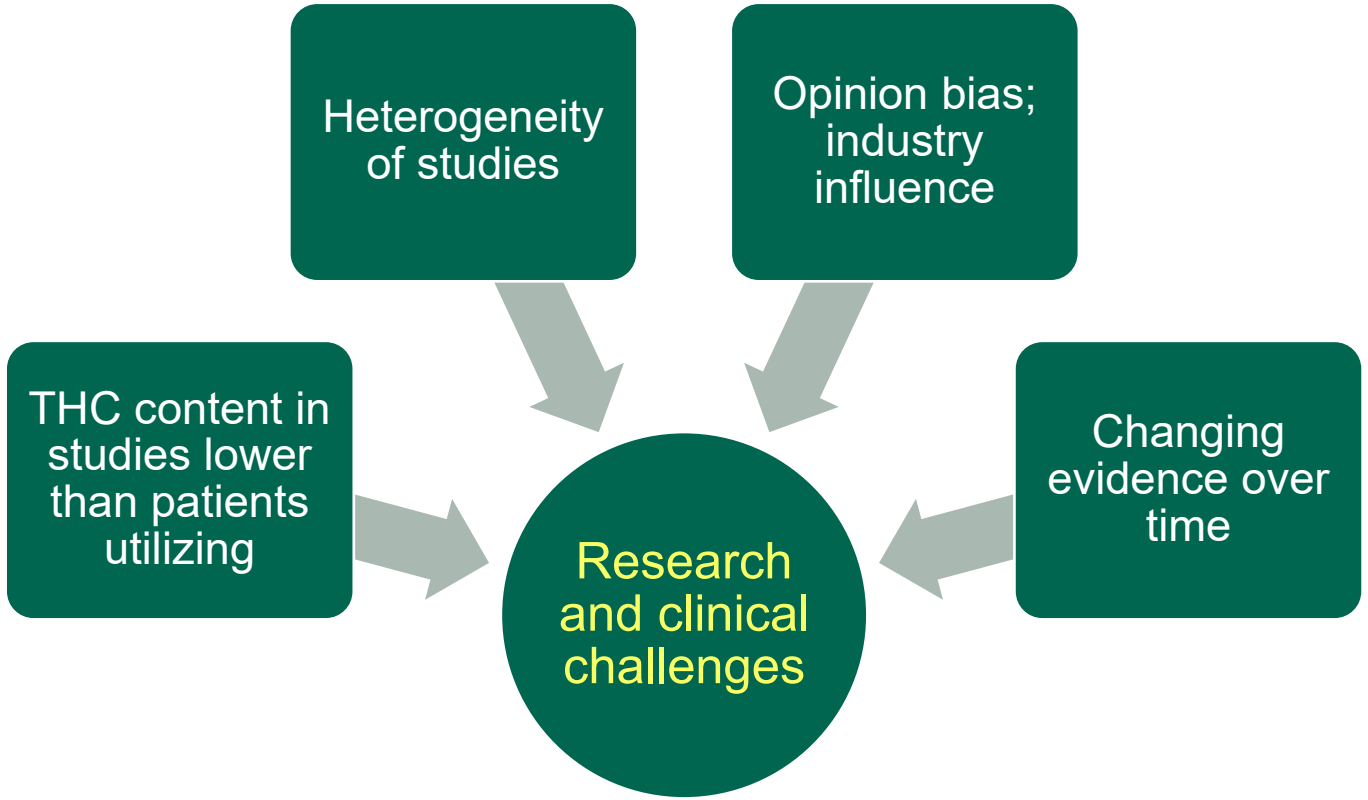
What does the evidence show about cannabis therapeutic effects?

Cannabis evidence of effects is difficult to accurately determine



NASEM; 2017https://www.nap.edu/catalog/24625/the-health-effects-of-cannabis-and-cannabinoids-the-current-state; Abrams, *Eu J Int Med,* 2018, 49, 7-11

Cannabis: Evidence of Effects

Substantial or conclusive evidence for efficacy

- Chronic pain in adults, particularly neuropathic pain[1,2]
- Chemotherapy-induced nausea & vomiting[1,3]
- Subjective spasticity multiple sclerosis[1]
- Epilepsy (Dravet and Lennox-Gastaut) CBD Epidiolex®[4]

Moderate

- Short-term sleep[1,5]

[1] NASEM; 2017https://www.nap.edu/catalog/24625/the-health-effects-of-cannabis-and-cannabinoids-the-current-state; [2]Nugent et al. 2017;*167*(5):319-331. [3]Lichtman et al JPSM 2018 https://doi.org/10.1016/j.jpainsymman.2017.09.001
[4]Chow et al. Support Care in Cancer. 2020;28:2095–2103 https://doi.org/10.1007/s00520-019-05280-4 ; MacCallum & Russo. *Eur J Int Med.* 2018;49:12-19; [4] Privitera et al. *Epilepsia.* 2021;62(5):1130-1140 [5]Bonaccorso. *Neurotoxicol.* https://doi.org/10.1016/j.neuro.2019.08.002

Cannabis: Evidence of Effects

Limited

- Appetite & weight loss in HIV/AIDS[1]
- Tourette symptoms[1]
- Anxiety symptoms in social anxiety disorders (CBD)[1,2]
- PTSD symptoms[1]
- Dementia[1]

Insufficient evidence

- Cancer cachexia >appetite, > side effects, <QOL[3]
- Cancer – most literature preclinical[4,5]
- Neurodegenerative disorders[1]
- Irritable bowel syndrome[1]
- Addiction abstinence[6]

[1] NASEM. 2017;https://www.nap.edu/catalog/24625/the-health-effects-of-cannabis-and-cannabinoids-the-current-state; [2]Wright. *Cannabis Cannabinoid Res* 2020. https://pubmed.ncbi.nlm.nih.gov/32923656/
[3]Wang et al. *Biomed Res Int.* 2019; https://doi.org/10.1155/2019/2864384; [4]Abu-Amna et al. *Curr. Treat. Options in Oncol*. 2021;22:16 doi: 10.1007/s11864-020-00811; [5]Goyal et al. *Comp Ther Med.* 2020; https://doi.org/10.1016/j.ctim.2020.102336; [6]Bonaccorso. *Neurotoxicol.* https://doi.org/10.1016/j.neuro.2019.08.002

CBD may have efficacy for symptoms such as anxiety, insomnia, addiction, and mood, but high-quality studies lacking

- Trials suggest that CBD may be effective for some anxiety[1]
  - Few human trials, mostly healthy males, social anxiety disorder[2]
- Preclinical, small clinical trials, anecdotal evidence
- *Unclear side effects of CBD use due to lack of studies*

Take home: Evidence is lacking, but people are experimenting with use of CBD for these conditions

[1]Wright. *Cannabis Cannabinoid Res* 2020. https://pubmed.ncbi.nlm.nih.gov/32923656/
[2]Bonaccorso. *Neurotoxicol.* https://doi.org/10.1016/j.neuro.2019.08.002

Cannabis product formulations

Smoked

- Rapid onset of action 5-10 min
- Duration 2-4 hr
- Bioavailability 10-30%

Vaporization

- Rapid onset of action (peak 5-10 min)
- Metered dosing devices
- Risk of EVALI (e-cig/vaping associated lung injury)

Edibles

- Slower onset of action 60-180 min
- Duration 6-8 hours
- Bioavailability 6% extensive first pass effects

Transmucosal Sublingual

- More rapid onset of action than orals 15-45 minutes
- Duration 6-8 hours
- Pharmaceutical form (nabiximols) available

Transdermal Topical

- Variable onset - duration
- Highly lipophilic
- Slow onset, stable blood levels

MacCallum & Russo. *Eur J Int Med.* 2018;49:12-19

Dartmouth Health

Project ECHO

Cannabis detection in urine drug testing varies

- Detection of THC in urine varies dependent on use
  - Single use 3 days
  - Moderate use (4x week) 5-7 days
  - Chronic use (daily) 10-15 days
  - Chronic heavy smoker >30 days

Moeller, Karen E. et al. Mayo Clinic Proceedings, 2017; (92)5: 774 - 796

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What are the adverse effects or potential harms of cannabis?

Reported THC adverse effects

Common reported adverse effects

- **CNS**
  - Drowsiness
  - Dizziness
  - Confusion
  - Mental Clouding
  - Slurred speech
- **Physical**
  - Tachycardia and hypotension
  - Nausea
  - Fatigue
  - Dry mouth
  - Cannabis hyperemesis syndrome

National Institute of Drug Abuse – Cannabis https://nida.nih.gov/research-topics/cannabis-marijuana#short-term-health-cannabis

CBD also has adverse effects

- Adverse effects to CBD less studied except for FDA approved Epidiolex® for seizures
- Reported adverse effects include
  - Drowsiness/sedation
  - Mood changes
  - Interactions with prescription medications that may affect actions and cause toxicity
  - Liver toxicity
  - Reproductive and developmental effects

Take home: People are experimenting with CBD and may not be cognizant of potential adverse effects

Huestis et al. Curr Neuropharmacol. 2019;17(10):974-989. doi: 10.2174/1570159X17666190603171901. Cannabidiol (CBD) – Potential Harms, Side Effects, and Unknowns; What You Need to Know (And What We're Working to Find Out) About Products Containing Cannabis or Cannabis-derived Compounds, Including CBD | FDA

Potential harms of cannabis use

Prenatal developmental changes	• Potential cognitive deficits, learning disabilities
Developmental changes in adolescents	• Intellectual, motivational, maturational
Motor vehicle accidents from acute cannabis intoxication	• Some studies show a significant correlation between high THC blood concentrations and car crash risk
Cardiopulmonary	• Mixed effects BP, Limited evidence - trigger MI, CVA, exacerbation COPD

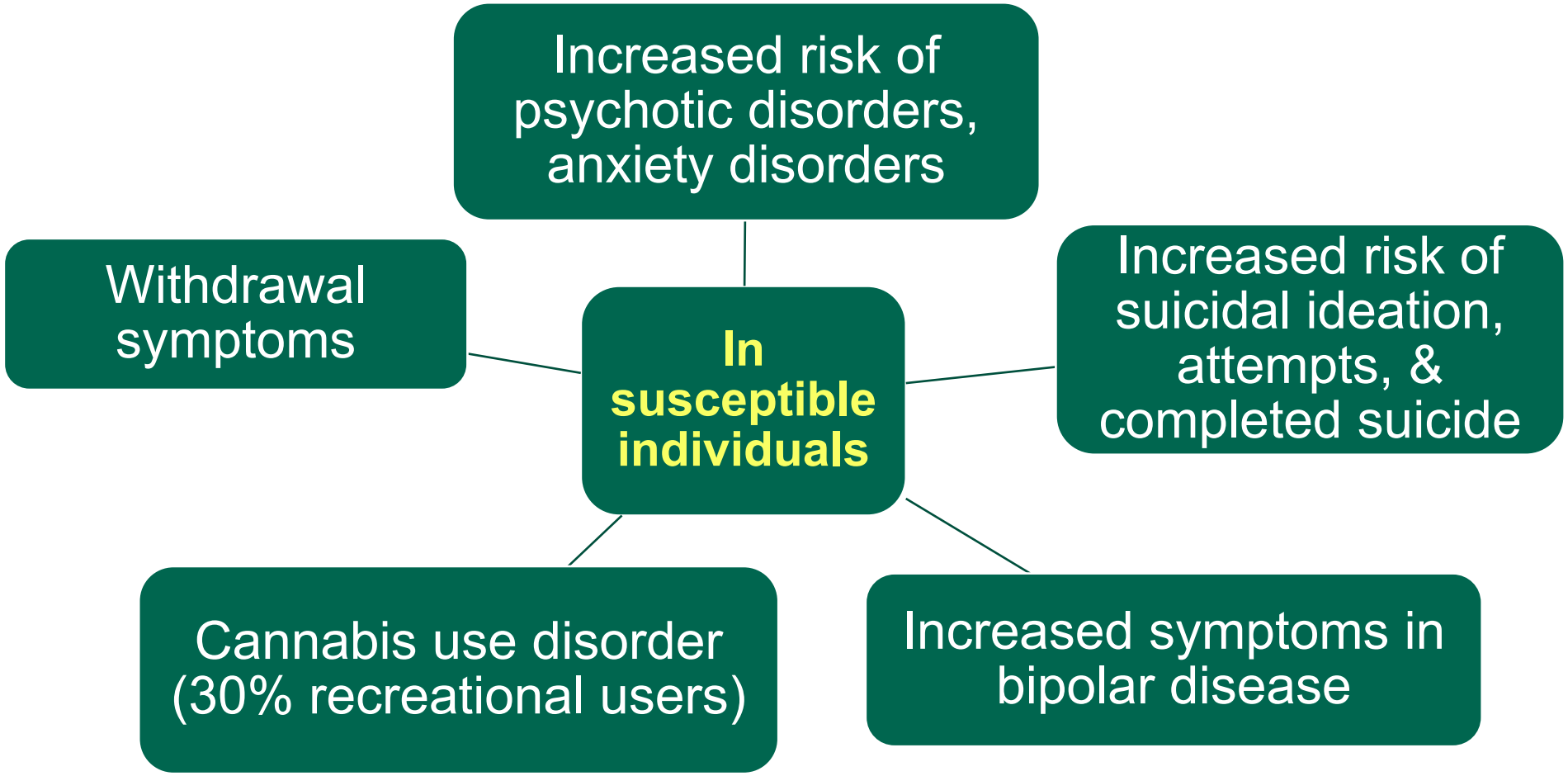
National Institute of Drug Abuse – Cannabis https://nida.nih.gov/research-topics/cannabis-marijuana#short-term-health-cannabis
Preuss et al. Front Psychiatry. 2021 28;12:643315. doi: 10.3389/fpsyt.2021.643315

Cannabis may affect work performance

- High quality studies evaluating effect of **medical** cannabis on workplace performance lacking[1]
  - Reported ‘adverse effects’ such as sedation, nausea/vomiting, dizziness and euphoria could be associated with performance
- Canadian study showed 2-fold increase of injury risk for ‘workplace cannabis use’ but none for ‘non-workplace use’[2]
- Case control study recreational marijuana legalization adoption and workplace injuries among younger workers aged 20 to 34 years
  - Recreational cannabis legalization adoption associated with 8.4% increase in injury[3]

[1]O’Neill et al. *Workplace Health & Safety*. 2023;71(9):400-410. doi:10.1177/21650799; [2] Carnide et al. *Canadian Journal of Public Health*. 2023;114(6):947-955. doi:10.17269/s41997-023-00795-0 ; Li et al.JAMA Health Forum. 2024 2;5(2):e235438. doi: 10.1001/jamahealthforum.2023.5438

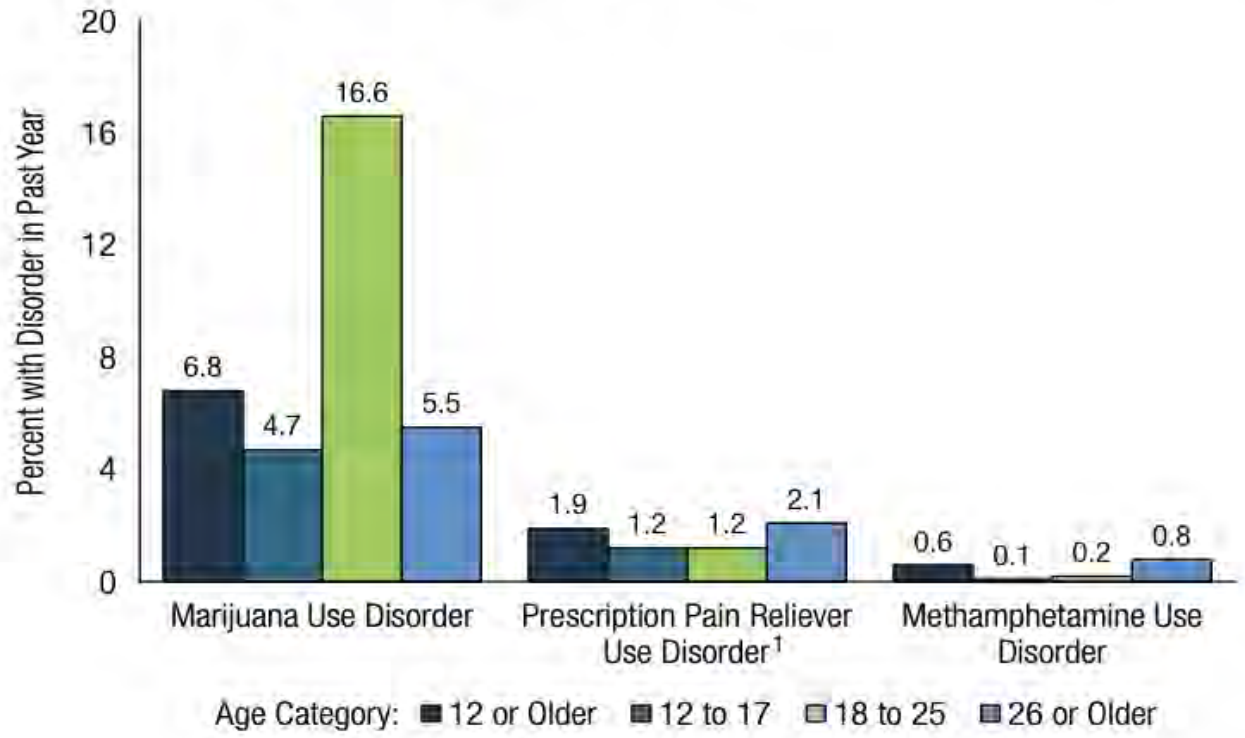
Potential mental health harms of cannabis



National Academies of Science, Engineering & Medicine, 2017 Report; Substance Abuse and Mental Health Services Administration-https://www.samhsa.gov/substance-use/learn/marijuana/risks

Cannabis Use Disorder (CUD) & absenteeism

Figure 32. Marijuana Use Disorder, Prescription Pain Reliever Use Disorder, or Methamphetamine Use Disorder in the Past Year: Among People Aged 12 or Older; 2023



Dose-response relationship observed between CUD severity and skipping work[2]

National Survey on Drug Use and Health, 2023 https://www.samhsa.gov/data/sites/default/files/reports/rpt47095/National%20Report/National%20Report/2023-nsduh-annual-national.pdfç;

[2]Yang et al . *American Journal of Preventive Medicine*. 2024;67(6):803-810. doi:10.1016/j.amepre.2024.07.021

Some take away considerations

- Cannabis use is common in the U.S.
- People use cannabis for diverse reasons
- Laws and regulations are variable at state levels
- Cannabis use may impact individual well-being, work performance and workplace safety

Selected References

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- Substance Abuse and Mental Health Services Administration. Know the risks, effects and side effects of marijuana. https://www.samhsa.gov/substance-use/learn/marijuana/risks (updated 11/2024)
- Substance Abuse and Mental Health Services Administration. Cannabidiol (CBD) – Potential harms, side effects and unknowns. Cannabidiol (CBD) – Potential Harms, Side Effects, and Unknowns (updated 2/2023)
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Thank you

WELCOME to the *Cannabis in the Workplace: An ECHO on Health, Safety, and Management*

Session 2, Impact of Cannabis on the Workplace, June 25, 2025

Marijuana in the Workplace

Douglas W Martin MD FACOEM FAAFP FIAIME

CNOS Occupational Medicine

Disclosure of Conflicts of Interest Regarding MRO and Fitness for Duty

ACOEM

- MRO Section Chair (2000-2020) volunteer
- Marijuana in the Workplace Taskforce (2015-present) volunteer
- MRO Comprehensive and Fast Track Course Chair (honoraria)
- Past President (2022-2023) volunteer
- Board of Directors (2025-2028) volunteer
- ACOEM Practice Guidelines Panel (volunteer)

MROCC

- Board of Directors (2022-present) stipend
- Secretary/Treasurer (2023-present)

Springer Publications

- *Independent Medical Evaluation – A Practical Guide (*royalty)

AMA

- *AMA Guides to the Evaluation of Workability and Return to Work 2nd ed Chapter 10 – The Challenges to and the Importance of the Primary Care Physician's Role in Return to Work*. (unpaid)

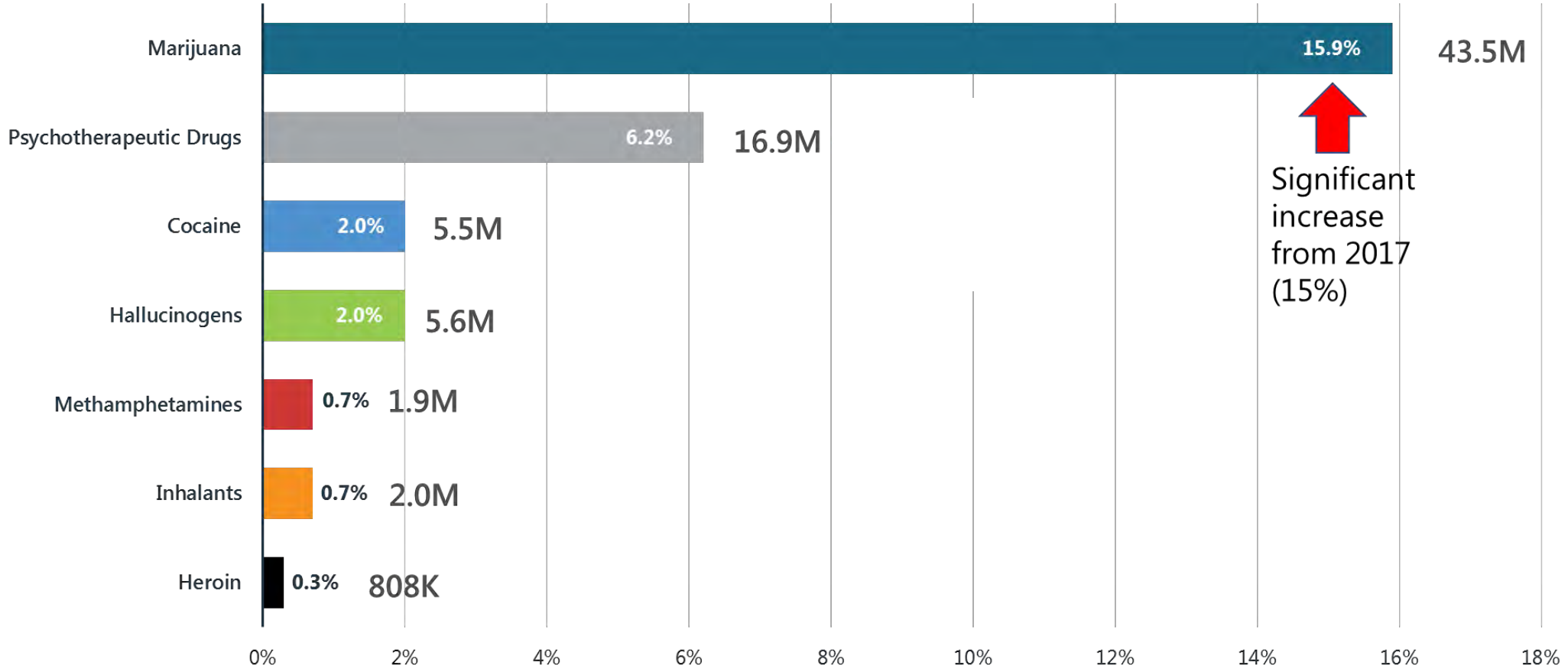
Principle Sources of Data on Drug Use

1. **National Survey on Drug Use and Health (NSDUH) – SAMHSA**
   - Annual survey of those age 12 and older in civilian households and non-institutionalized group quarters
   - 2022 expanded from household interviews to include web
2. **Monitoring the Future Survey – NIDA through U. of Michigan**
   - Annual survey of 8th, 10th, and 12th grade secondary school students
3. **Drug Abuse Warning Network (DAWN) - SAMHSA**
   - Tracked drug-related ED visits in 52 hospitals through 2021
4. **National Drug Early Warning System (NDEWS) - NIDA**
   - 18 sentinel communities throughout US, expanded in 2020

OBJECTIVES

- Review incidence and demographics of worker cannabis use
- Articulate the current consensus recommendations regarding safety sensitive work
- Identify challenges and future goals regarding the determination of work performance and cannabis use

Most Commonly Used Drugs



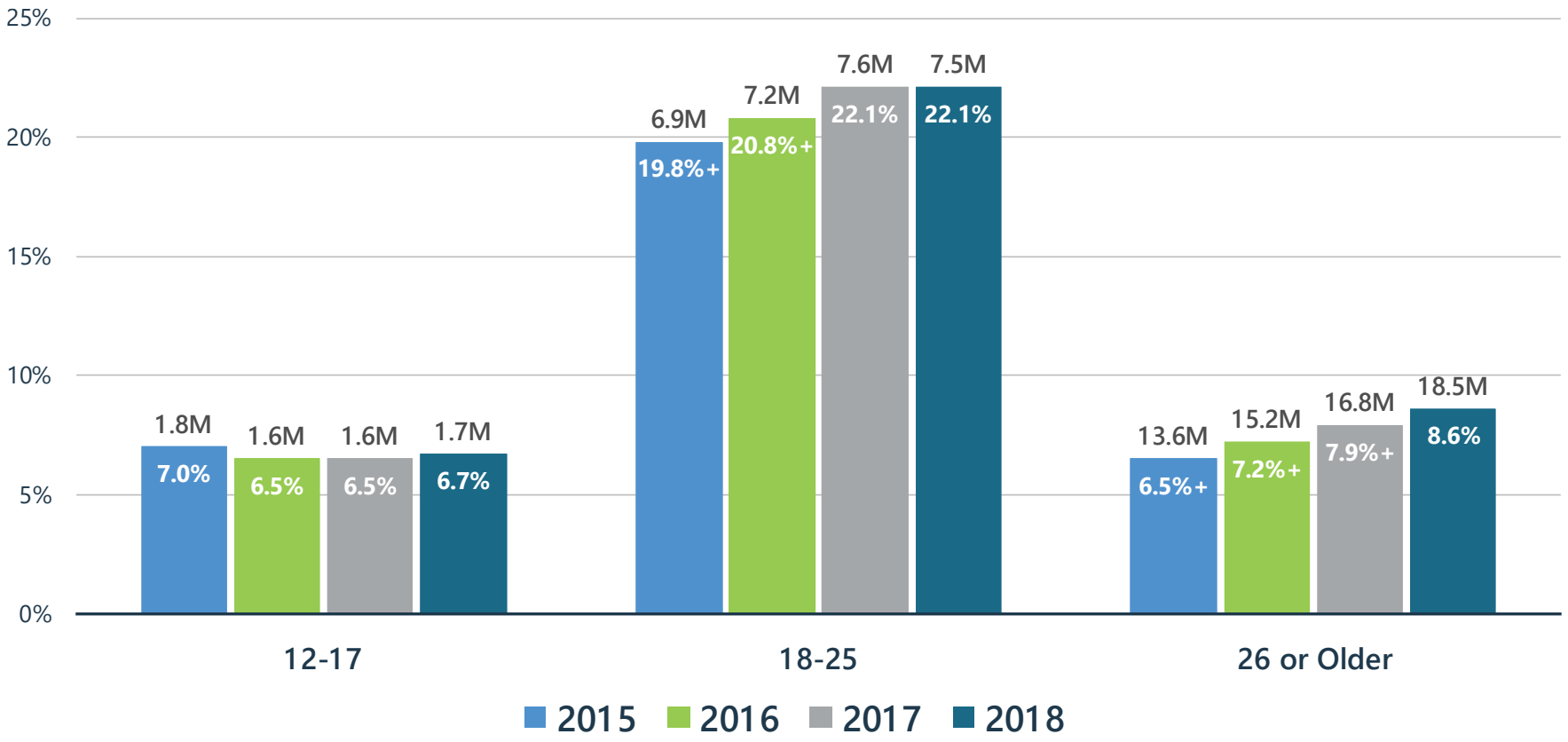
Past year, 12+
National Survey on Drug Use & Health, 2018
https://x.com/samhsagov/status/1164201504825335810

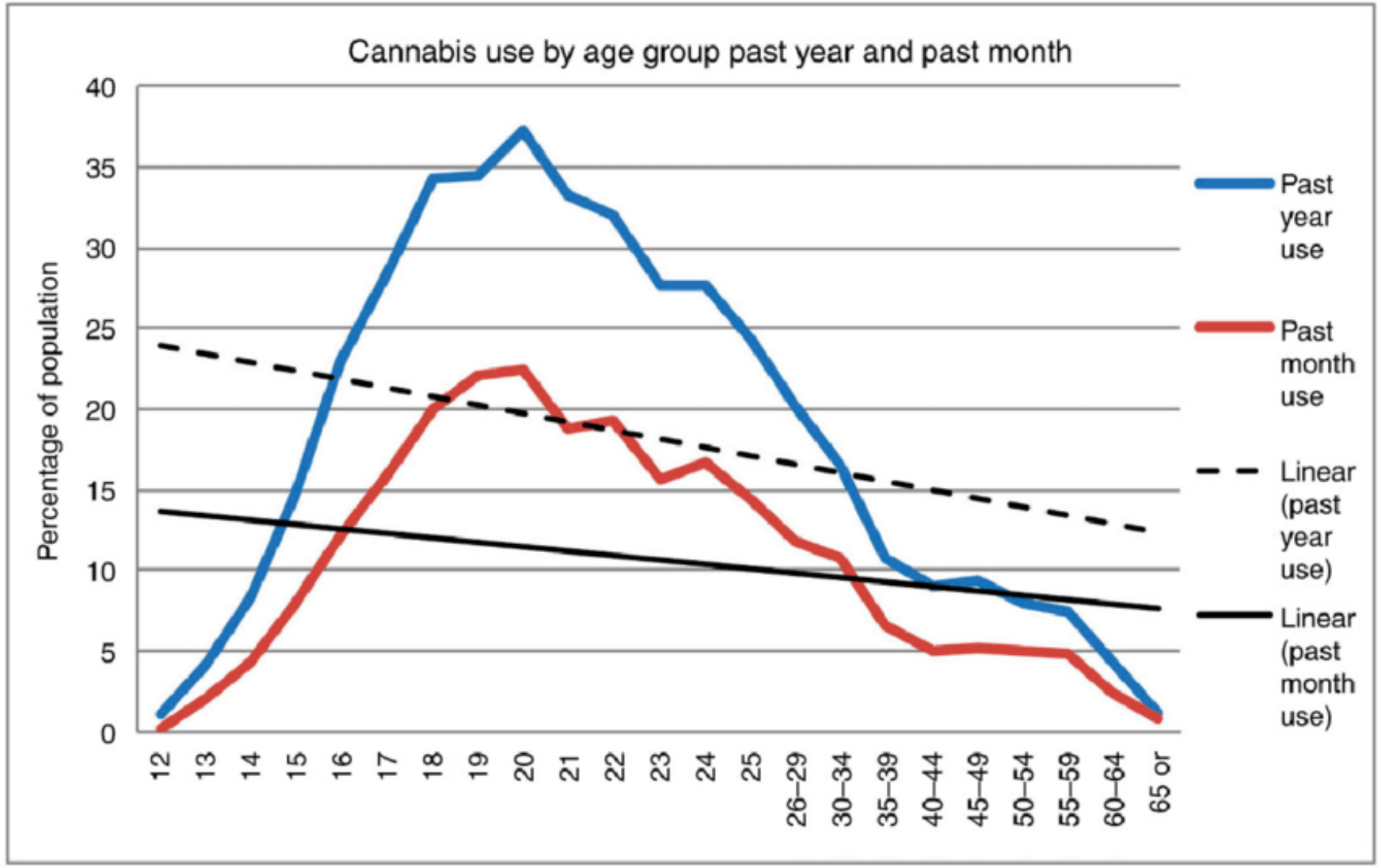
SAMHSA

MONTH, 2015-2018 NSDUH, 12+

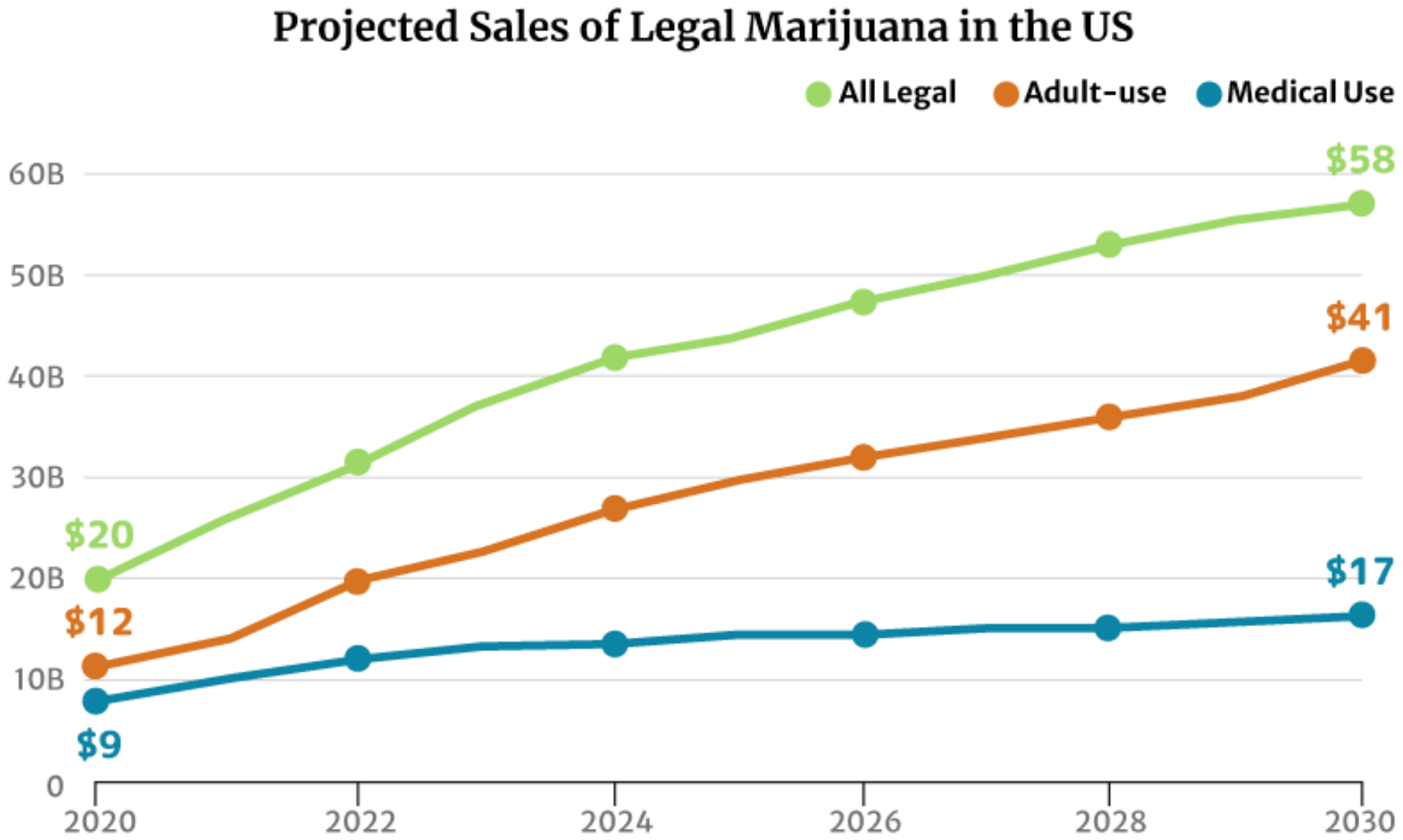
Marijuana Use

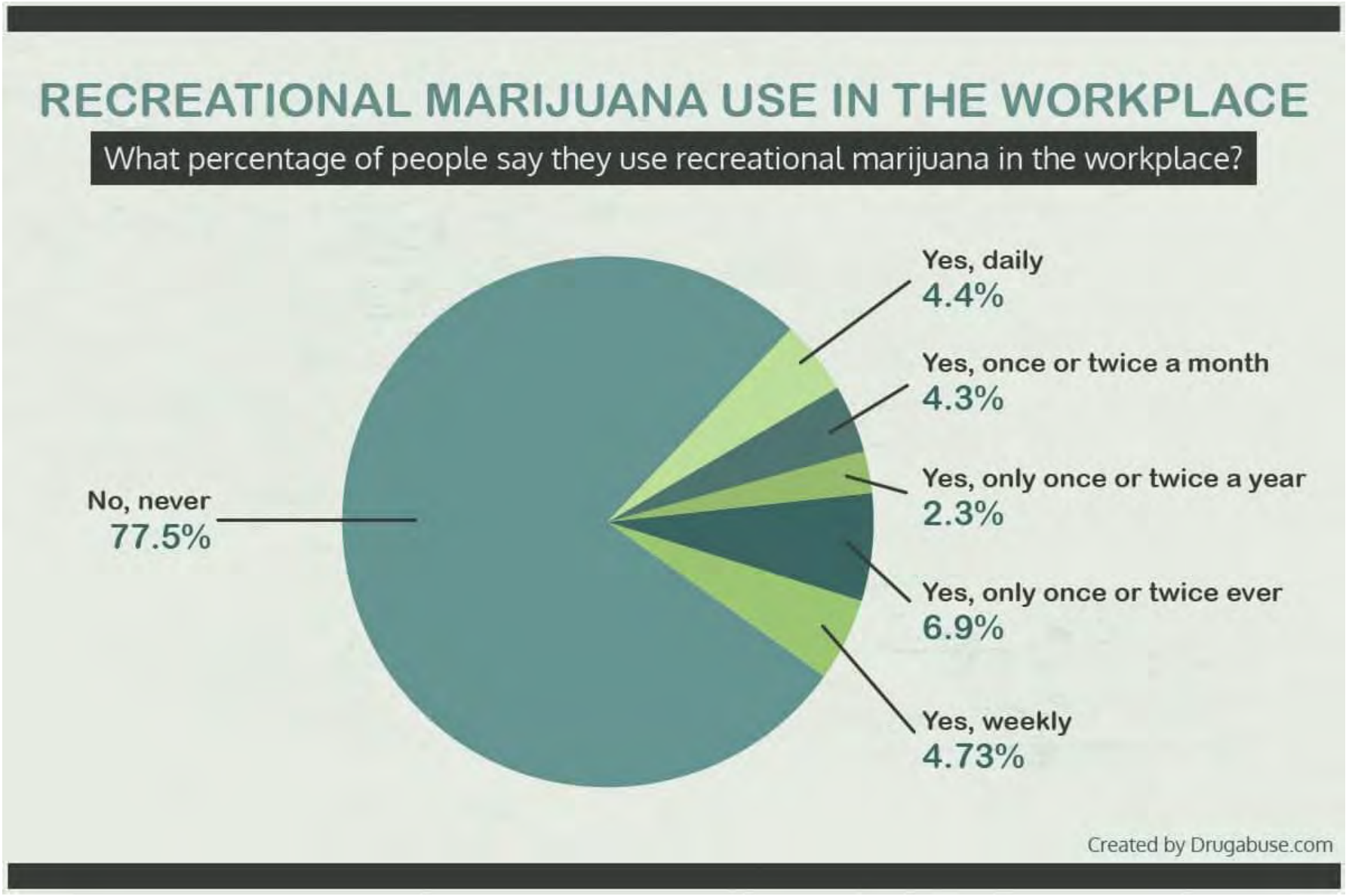
+ Difference between this estimate and the 2018 estimate is statistically significant at the .05 level.





Bergen-Cico, Dessa & Cico, Rachael; Chapter 4, Age as a Predictor of Cannabis Use; in Handbook of Cannabis and Related Pathologies: Biology, Pharmacology, Diagnosis, and Treatment, Academic Press-Elsevier, 2017

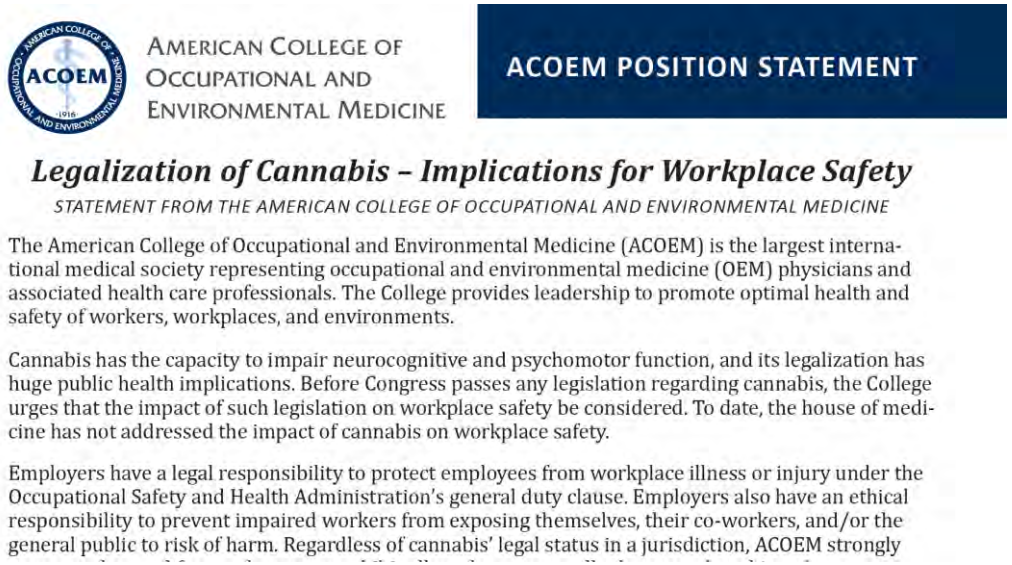

Projected Sales of Legal Marijuana in the US
All Legal
Adult-use
Medical Use
60B
50B
40B
30B
20B
10B
0
$58
$41
$20
$17
$12
$9
2020
2022
2024
2026
2028
2030



https://drugabuse.com/addiction/substance-abuse-workplace/

Legalization of Cannabis – Implications for Workplace Safety

Statement from the American College of Occupational and Environmental Medicine August 2023



AMERICAN COLLEGE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

ACOEM POSITION STATEMENT

Legalization of Cannabis – Implications for Workplace Safety

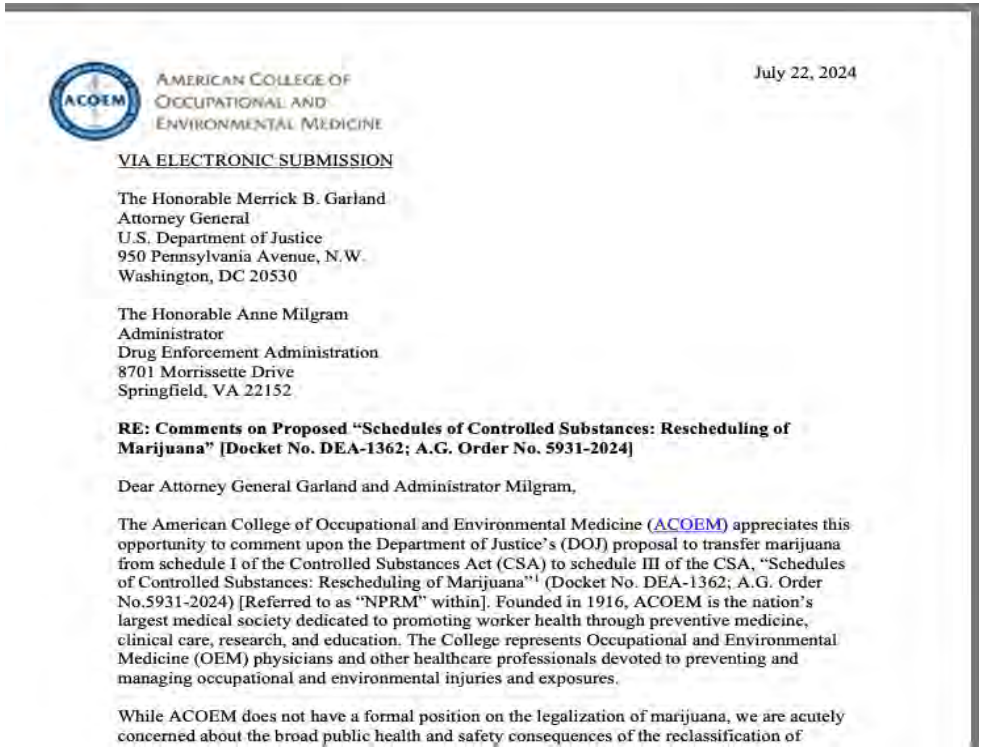
STATEMENT FROM THE AMERICAN COLLEGE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

The American College of Occupational and Environmental Medicine (ACOEM) is the largest international medical society representing occupational and environmental medicine (OEM) physicians and associated health care professionals. The College provides leadership to promote optimal health and safety of workers, workplaces, and environments.

Cannabis has the capacity to impair neurocognitive and psychomotor function, and its legalization has huge public health implications. Before Congress passes any legislation regarding cannabis, the College urges that the impact of such legislation on workplace safety be considered. To date, the house of medicine has not addressed the impact of cannabis on workplace safety.

Employers have a legal responsibility to protect employees from workplace illness or injury under the Occupational Safety and Health Administration's general duty clause. Employers also have an ethical responsibility to prevent impaired workers from exposing themselves, their co-workers, and/or the general public to risk of harm. Regardless of cannabis' legal status in a jurisdiction, ACOEM strongly

ACOEM Comment on Rescheduling of Marijuana July 22, 2024



AMERICAN COLLEGE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

July 22, 2024

VIA ELECTRONIC SUBMISSION

The Honorable Merrick B. Garland
Attorney General
U.S. Department of Justice
950 Pennsylvania Avenue, N.W.
Washington, DC 20530

The Honorable Anne Milgram
Administrator
Drug Enforcement Administration
8701 Morrissette Drive
Springfield, VA 22152

RE: Comments on Proposed "Schedules of Controlled Substances: Rescheduling of Marijuana" [Docket No. DEA-1362; A.G. Order No. 5931-2024]

Dear Attorney General Garland and Administrator Milgram,

The American College of Occupational and Environmental Medicine (ACOEM) appreciates this opportunity to comment upon the Department of Justice's (DOJ) proposal to transfer marijuana from schedule I of the Controlled Substances Act (CSA) to schedule III of the CSA, "Schedules of Controlled Substances: Rescheduling of Marijuana"[1] (Docket No. DEA-1362; A.G. Order No.5931-2024) [Referred to as "NPRM" within]. Founded in 1916, ACOEM is the nation's largest medical society dedicated to promoting worker health through preventive medicine, clinical care, research, and education. The College represents Occupational and Environmental Medicine (OEM) physicians and other healthcare professionals devoted to preventing and managing occupational and environmental injuries and exposures.

While ACOEM does not have a formal position on the legalization of marijuana, we are acutely concerned about the broad public health and safety consequences of the reclassification of

https://acoem.org/acoem/media/PDF-Library/07-22-24_ACOEM_Comments_DOJ_Marijuana_Rescheduling_NPRM.pdf

What Forms the Basis for the ACOEM Position Statement (and adopted by other organizations?)

- Mainly from research on the effects of driving
- **"Determining the magnitude and duration of acute Δ9-tetrahydrocannabinol (Δ9-THC)-induced driving and cognitive impairment: A systematic and meta-analytic review" *Neuroscience and Biobehavioral Reviews*, July '21, D. McCartney, et. al.**
- Cannabis impairs driving performance and crucial cognitive skills.
- Following inhalation Δ9-THC 20mg, driving-related cognitive skills are predicted to recover within ~5 hours, and nearly all within 7 hours. Impairment from oral consumption of Δ9-THC may persist for a longer duration.
- The magnitude of impairment varies based on factors like dosage, time elapsed after consumption, tolerance, route of administration and the specific cognitive skill being evaluated.

Cannabinoid Use for Safety-Critical Workers

ACOEM Practice Guidelines - effective January 28, 2025

Not Recommended

Acute or chronic cannabinoid use is not recommended for individuals who perform safety-critical jobs. These jobs include the operation of motor vehicles, forklifts, overhead cranes, heavy equipment, or other modes of transportation; sharps work (e.g., knives); work with injury risks (e.g., heights); and tasks involving high levels of cognitive function and judgment. There are other management strategies with less risk of impairment.

Strength of evidence	Not Recommended, Evidence (C)
Level of confidence	Moderate

Rationale

See the section on Adverse Events for details on motor vehicle collision and injury risk. Epidemiological and driving simulator studies are largely consistent that there is significant risk of motor vehicle crashes associated with cannabinoids. Thus, the preclusion of safety-critical job functions while under treatment with either medical or recreational cannabinoids is recommended.

Recent Literature on Workplace Accidents

"Recreational Marijuana Legalization and Workplace Injuries Among Younger Workers" *JAMA*, Feb., '24, L. Li, et. al.

- ~10% increase in on-the-job injuries among 20-to 34-year-old workers in RCL (recreational cannabis law) states.
- Injury rate per 100 workers rose 8.4% in RCL states.
- In contrast, no link between workplace injuries and cannabis use was found in the states that don't permit the sale of cannabis for recreational use.
- Authors speculated older workers use cannabis for pain management and sleep disorders > recreational purposes.

Occupational & Environmental Association of Canada Position Statement on Cannabis Use and Work

"It is recognized that the timing and duration of cannabis impairment is variable and that more research is needed in this regard. To provide practical guidance, until definitive evidence is available, it is not advisable to operate motor vehicles or equipment or engage in other safety-sensitive tasks for 24 hours following cannabis consumption, or for longer if impairment persists."

Workplace Performance and Cannabis

- There is not much research on this topic.
- What is published is mixed
- One study, reported by the National Institute on Drug Abuse (NIDA), found 55% more industrial accidents, 85% more injuries, and 75% greater absenteeism among employees who tested positive for marijuana compared to those who tested negative.

NIDA Report: Marijuana https://www.drugabuse.gov/publications/research-reports/marijuana

- However, not all research is as conclusive:
  A systematic review published in May 2020 found that the current body of literature does not provide sufficient evidence that marijuana users are at increased or decreased risk for occupational injury, and that further high-quality research is needed to eliminate study biases and provide clarity on causality.

Wade R. Biasutti, Kurt S. H. Leffers & Russell C. Callaghan (2020): Systematic Review of Cannabis Use and Risk of Occupational Injury, Substance Use & Misuse, DOI: 10.1080/10826084.2020.1759643

Dartmouth Health

Project ECHO

Everyone Is Looking for the Magic Test That Can Predict Worker Fitness, But….

- No conclusive test for impairment
- Stratification of risk: low, moderate, high risk of impairment (useful?)
- Factors include:
    a. THC dosage
    b. Route of administration
    c. Concurrent medications
    d. Recreational substance use
    e. Education and monitoring, HCP, Products

Takeaways

- Both medicinal and recreational cannabis is here to stay
- There is rightful concern about workers who use cannabis regarding safety sensitive job tasks and overall worker performance
- WE NEED MORE RESEARCH
- The struggle on surveillance, monitoring, and implementation of policies focused on worker health and risk mitigation continues and is not simple.

Reference List

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- “Cannabis and Alcohol Use by U.S. Young Adults, 2008–2019: Changes in Prevalence After Recreational Cannabis Legalization [RCL]” *American Journal of Preventive Medicine*, Dec. ‘23, Kerr, et. Al
- “Impacts of recreational cannabis legalization on cannabis use: a longitudinal discordant twin study” *Addiction*, July ‘22, Zeller, et. al.
- “Recreational Marijuana Legalization and Workplace Injuries Among Younger Workers” *JAMA*, Feb., ‘24, L. Li, et. al.
- “Determining the magnitude and duration of acute Δ9-tetrahydrocannabinol (Δ9-THC)-induced driving and cognitive impairment: A systematic and meta-analytic review” *Neuroscience and Biobehavioral Reviews*, July ‘21, D. McCartney, et. al.
- *MacCallum CA, Lo LA, Pistawka CA, Christiansen A, Boivin M, Snider-Adler M. A Clinical Framework for Assessing Cannabis-Related Impairment Risk. Front Psychiatry. 2022 Jun 24;13:883517.*
- The American College of Occupational and Environmental Medicine (ACOEM). Cannabis: Treatment recommendations: Safety-Critical Workers. URL: https://app.mdguidelines.com/acoemtext/acoem%2Fdisorders%2Fcannabis%2Ftreatment-recommendations%2Fsafety-critical-workers.
- Yu, Bin, Chen, Xinguang, Chen, Xiangfan, Yan, Hong. Marijuana legalization and historical trends in marijuana use among US residents aged 12–25: results from the 1979–2016 National Survey on drug use and health.*BMC Public Health*; 2020/02/04
- ElSohly MA, Chandra S,Radwan M,et al. A Comprehensive Review of Cannabis Potency in the United States in the Last Decade.*Biol Psychiatry Cogn Neurosci Neuroimaging*; 2021.
- *2 Eadie, L., Lo, L. A., Christiansen, A., Brubacher, J. R., Barr, A. M., Panenka, W. J., & MacCallum, C. A. (2021). Duration of Neurocognitive Impairment With Medical Cannabis Use: A Scoping Review. Frontiers in psychiatry, 12, 638962.*

WELCOME to the *Cannabis in the Workplace: An ECHO on Health, Safety, and Management*

Session 3, Cannabis Testing, July 9, 2025

Cannabis in the Workplace: Cannabis Testing

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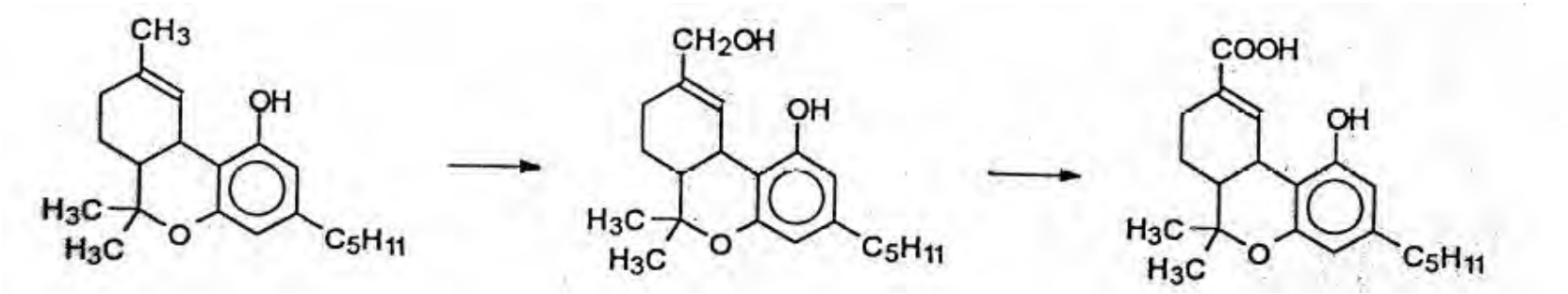
Key Considerations for Workplace Drug Testing for Cannabis

- 15 to 20 percent of US teens and adults use cannabis at least monthly [SAMHSA, 2024]
- Among those, approximately one-third to one-half use it on a daily or near daily basis [CDC, BRFSS, 2024]
- Chronic frequent users develop tolerance to the acute effects of cannabis on performance [Ramaekers et al, 2009; Desrosiers et al, 2015]
- Acute impairment, when it occurs, usually resolves by 5 hours (inhaled) or by 8 hours (oral) [Arkell et al, 2021]

Within-person decrements in driving performance or psychomotor function appear small relative to population variability and challenging to detect in the absence of baseline measurements.

Is there a reliable approach to detection of recent cannabis use that *possibly* caused impairment when investigating transportation crashes or workplace accidents?



THC

THC- OH

THC- COOH
"carboxy THC"

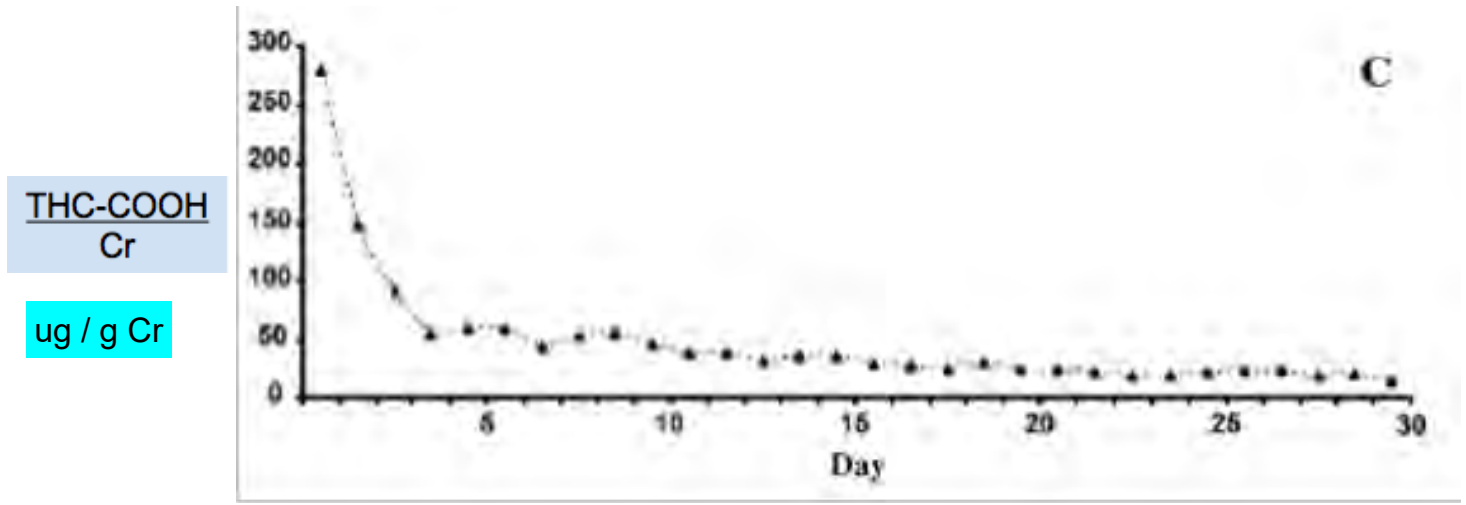
Urine workplace drug testing measures THC-COOH, an inactive metabolite that may be detectable days to weeks after last use

Journal of Analytical Toxicology, Vol. 32, October 2008

Urinary Elimination of 11-Nor-9-Carboxy-Δ^9-tetrahydrocannnabinol in Cannabis Users During Continuously Monitored Abstinence*

Robert S. Goodwin[1], William D. Darwin[1], C. Nora Chiang[2], Ming Shih[2], Shou-Hua Li[2], and Marilyn A. Huestis[1,†]

[1]Chemistry and Drug Metabolism Section, Intramural Research Program and [2]Division of Pharmacotherapies and Medical Consequences of Drug Abuse, National Institute on Drug Abuse, National Institutes of Health, Rockville, Maryland



It may take several hours to a few days after last usage for THC- COOH to reach peak levels in the urine (Huestis and Cone, 1998; Niedbala et al, 2001; Goodwin et al, 2008).

Accordingly, the concentration of THC-COOH in the urine of regular marijuana users is predominantly a reflection of past usage, and not consumption within the past several hours (Desrosiers et al, 2014)

U.S. Department of Transportation
National Highway Traffic Safety Administration

Drugs and Human Performance Fact Sheets (2014 update)

Cannabis: Interpretation of Urine Test Results: *Detection of total THC metabolites in urine, primarily THC-COOH-glucuronide, only indicates prior THC exposure. Detection time is well past the window of intoxication and impairment.*

A positive urine drug test does not indicate the last time of cannabis use by the donor, the amount that they consumed, or their state of intoxication (if any).

Is it essential for your employees to totally abstain from cannabis use, including during non-work hours, weekends, and holidays?

If the answer is no:

Why would you conduct post-accident urine testing for cannabis (THC-COOH)?

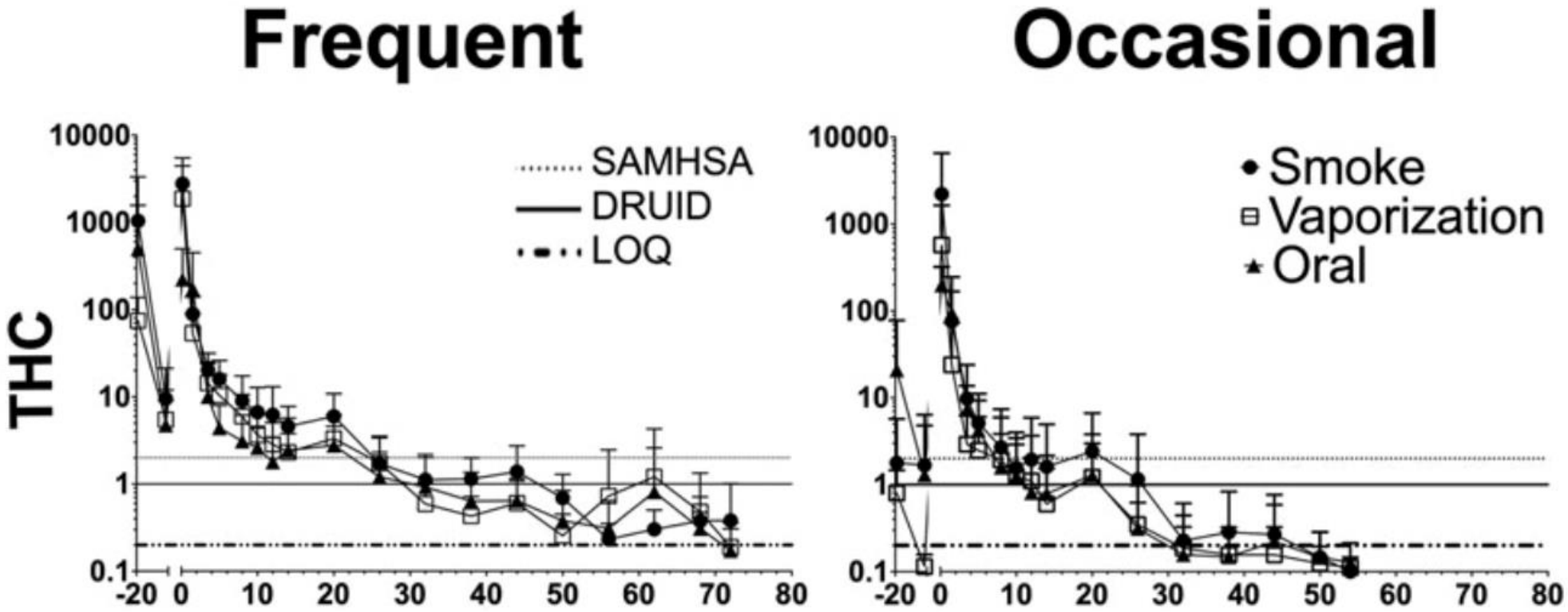
Testing of **oral fluid** for THC, as an alternative to urine drug testing, was approved by HHS (SAMHSA) in 2019; and by DOT in 2022* for mandatory federal workplace drug testing. (*Implementation pending)

Some cited advantages of oral fluid testing over urine drug testing:

- less expensive
- less intrusive
- less subject to adulteration (cheating)
- can be collected at work or site of transportation incident, with rapid onsite initial test results yielded by immunoassay

"Initial test" cut-off for positive: ≥ 4 ng/ml;
Confirmatory test cut-off: ≥ 2 ng/ml (LC/MS-MS)

As acknowledged by DOT, the “window of detection” for a positive oral fluid THC test may extend to 24 hours after last usage (or longer)



Swortwood et al Drug Test. Analysis 2017, 9, 905–915

An Oral Fluid test for THC may remain positive long after the interval of acute psychoactive effects and potential acute drug-induced impairment

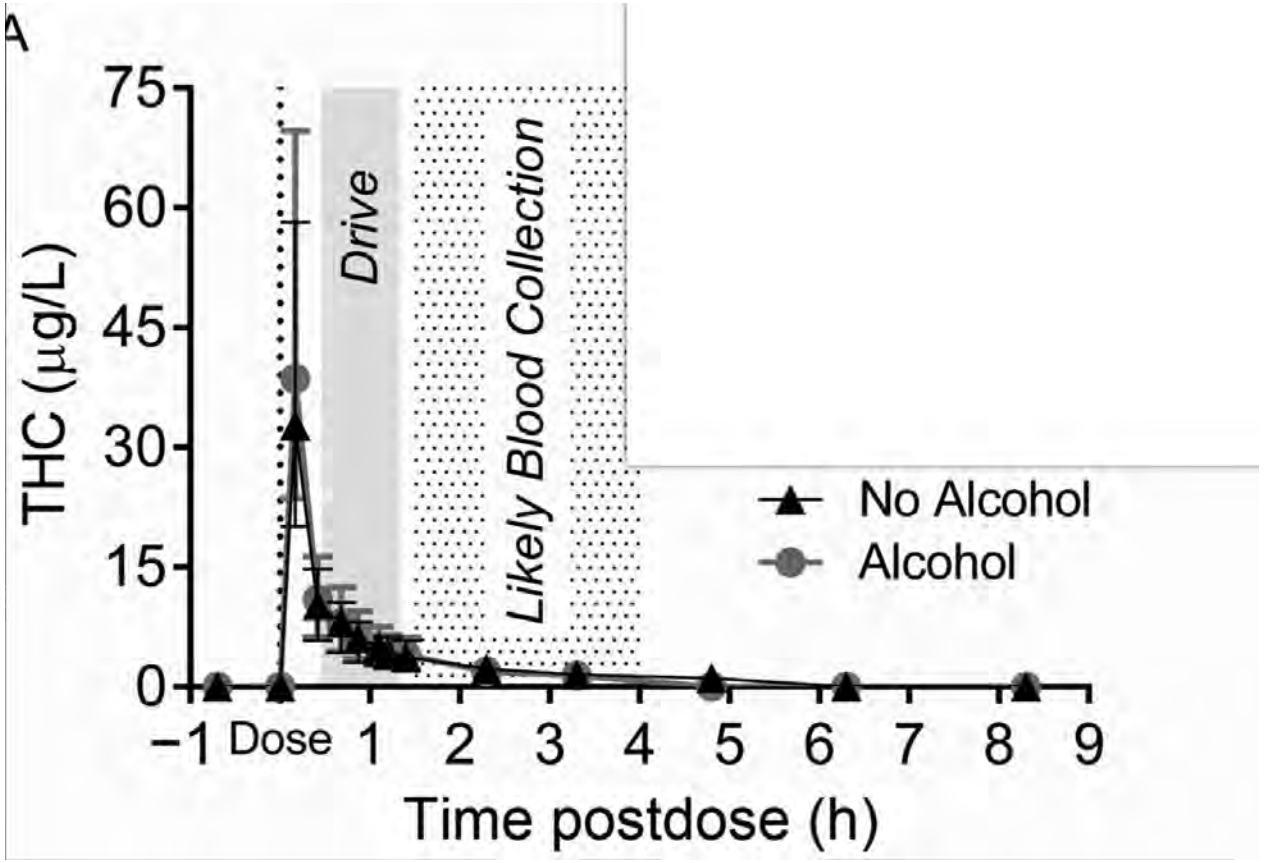
THC in oral fluid reflects topical contamination of the oral mucosa after inhaling THC, or ingesting an edible that at least partially dissolves in the oral cavity

An oral fluid test for THC is unlikely to detect THC that is ingested in a capsule or other form that does not dissolve or deposit in the oral cavity.

(Milman G et al, Anal Bioanal Chem 2011; 401:599-607)

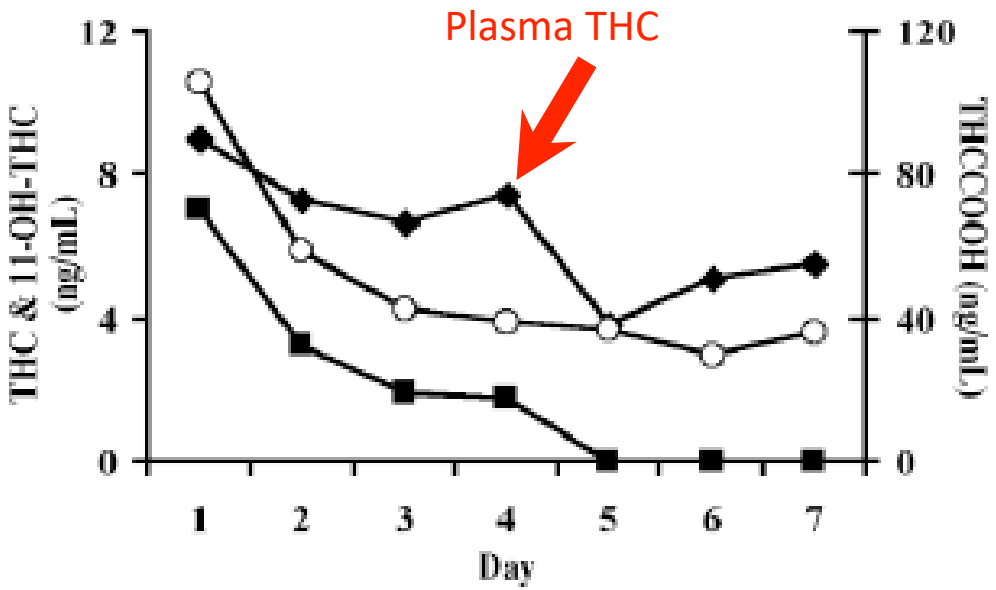
THC in whole blood is preferred matrix for post-incident testing in forensic settings (e.g. transportation crashes) but is seldom used in the workplace.

There is typically a delay in collection of post-crash blood. As shown below (Hartman et al, 2016) in **occasional users**, whole blood THC may decline by > 90% by 1.4 hours post- inhalation



Clin Chem 62:367-377; 2016

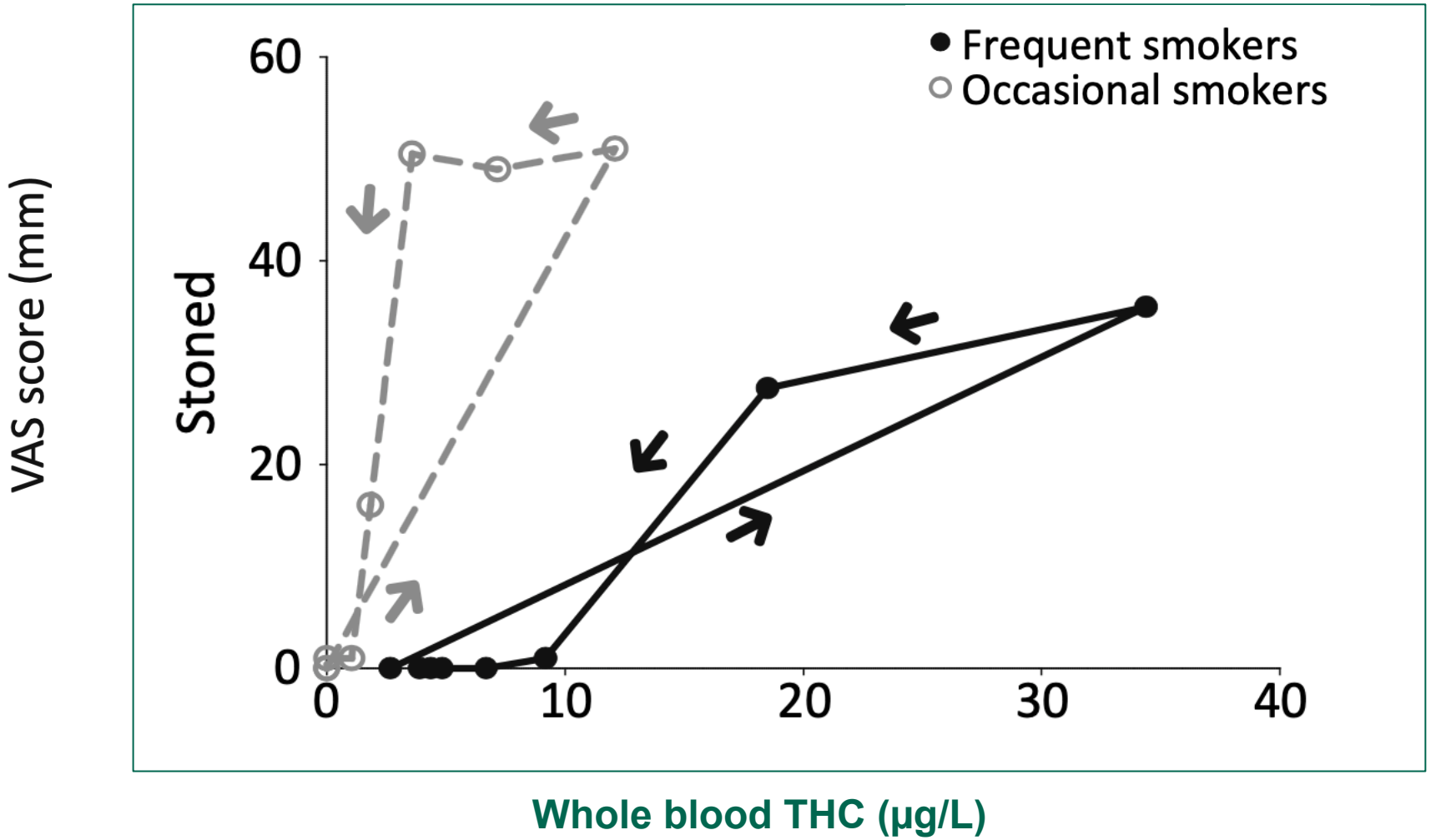
In chronic daily users, tolerance to the effects of THC and its prolonged presence in blood may limit the predictive value of THC levels for detection of impairment or recent use



days of supervised abstinence

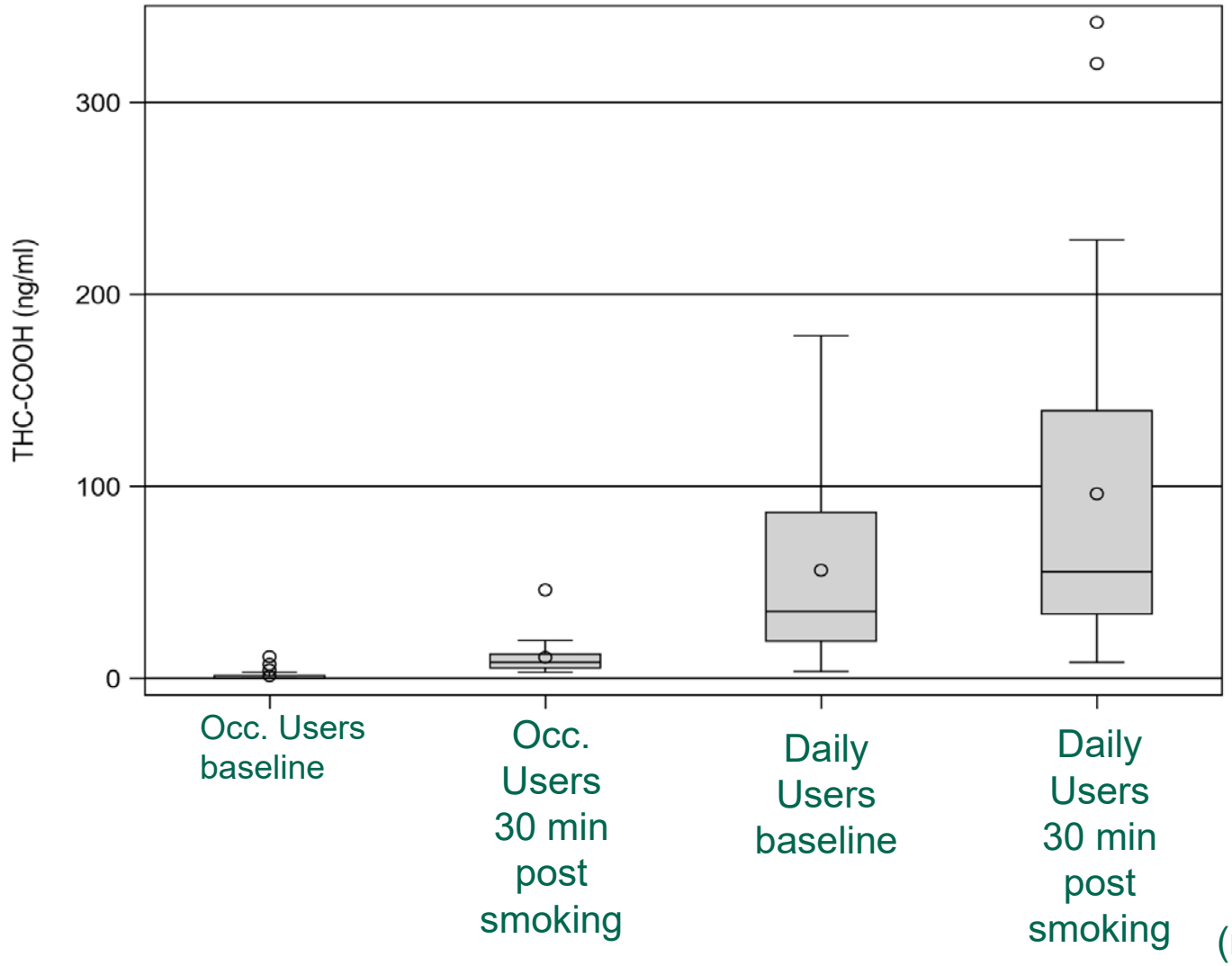
Karschner et al, J Anal Toxicol 33:469-477; 2009

Counterclockwise hysteresis: Subjective cannabis effects and blood THC after acute smoking in occasional and frequent users [Desrosiers et al, J Anal Toxicol 2015; 39:251-261]



After controlled smoking of joint with 6.8% THC, (54 mg THC)

Whole Blood THC-COOH is a biomarker that distinguishes chronic frequent (daily) users from occasional users. Kosnett MJ et al. J Med Toxicol 19:126; 2023



(n = 92 users; 184 observations)

Blood cannabinoid molar metabolite ratios are superior to blood THC as an indicator of recent cannabis smoking

Michael J. Kosnett[a,b], Ming Ma[c], Gregory Dooley[d], George Sam Wang[e], Kyle Friedman[f], Timothy Brown[g], Thomas K. Henthorn[h] and Ashley Brooks-Russell[c]

CLINICAL TOXICOLOGY
2023, VOL. 61, NO. 5, 355–362
https://doi.org/10.1080/15563650.2023.2214697

MMR_1

$$\frac{\text{THC} / 314.5}{\text{THC-COOH} / 344.5}$$

MMR_2

$$\frac{\text{THC} / 314.5 + \text{THC-OH} / 330.5}{\text{THC-COOH} / 344.5}$$

Blood cannabinoids were measured at **abstinent baseline, and 30 minutes after the start of a 15-minute interval of ad-libitum smoking cannabis** in 24 occasional and 32 daily cannabis smokers

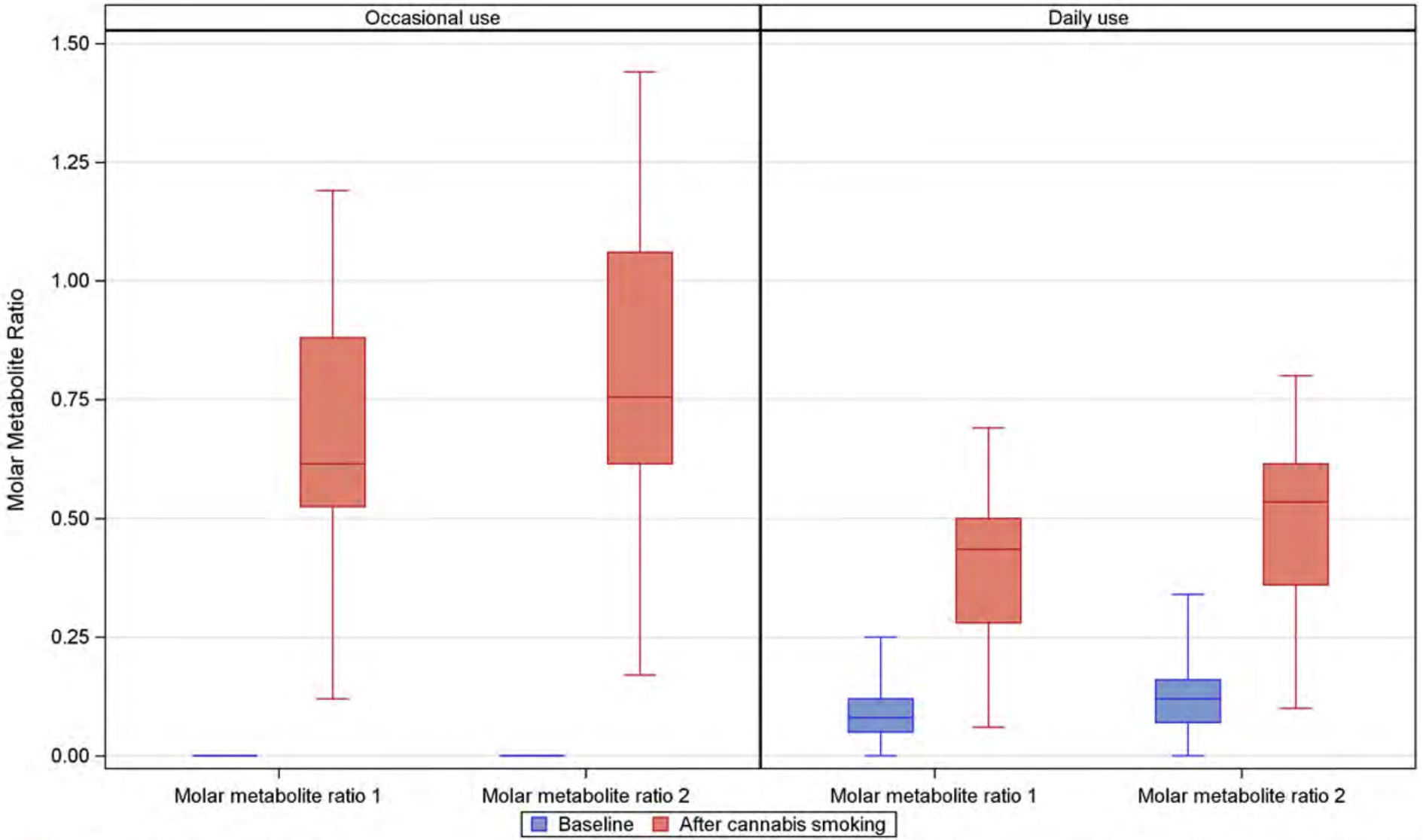


Figure 1. Molar metabolite ratio distributions among occasional and daily cannabis users. Boxes represent interquartile range (25–75th percentile); Horizontal line represents median. Whiskers are drawn to the minimal and maximal values.

Kosnett et al, 2023

Whole Blood Cannabinoid Molar Metabolite Ratios may inform on cannabis use just before or at work, when psychoactive drug effect might be present.

Optimal Cut-points for prediction of recent smoking	SENSITIVITY	SPECIFICITY	ACCURACY
$MMR_1 \geq 0.18$	93 %	98%	96%
$MMR_2 \geq 0.27$	91%	98%	95%
THC ≥ 5.3 ng/ml	73%	88%	80%

n = 112 observations, baseline and 30 min post-smoking, in 24 occasional cannabis smokers and 32 daily cannabis smokers

Summary of key points for workplace drug testing for cannabis

Urine tests (for THC-COOH) may remain positive for days to weeks and are suited to workplaces which require total abstinence from cannabis use, even outside of work hours. Positive tests are not reliable indicators of the potential presence of acute psychoactive effects.

Oral fluid tests for THC may offer logistical and cost advantages compared to urine tests but also have a window of detection (up to 24 hours or longer) that exceeds the duration of acute THC effects.

Whole blood THC correlates better than urine or oral fluid with acute psychoactive effects, including *possible* decrements in performance, particularly in occasional users.

THC-COOH is a biomarker of chronic frequent cannabis use (over interval of weeks to month), and high values may be associated with drug tolerance.

Cannabinoid molar metabolite ratios are superior to blood THC as an indicator of recent cannabis smoking and may have role in forensic or post-incident investigations.