The Impact of Cannabis Legalization on Child and Adolescent Health

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Learning Objectives

- Describe trends in youth cannabis exposure post-legalization
- Recognize health risks across developmental ages
- Identify screening, prevention and harm-reduction approaches
- Understand appropriate triaging across developmental ages

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Case 1

- 6-year old with unexplained lethargy after school drop off

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Case 2

- 15-year-old found with marijuana "cart" at school
  - Declining academic performance noted over past year

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Background

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Term	Definition
Cannabis	Product(s) derived from Cannabis plant (e.g. C. sativa, C indica, and hybrids)
Cannabinoids	A class of chemical compounds that act on cannabinoid receptors in the body
Delta-9 THC	Phytocannabinoid with psychoactive properties through its actions on cannabinoid receptors
Marijuana	>0.3% THC
Hemp	<0.3% THC
Delta-8 THC	Structural analog of delta 9, lower potency
Cannabidiol (CBD)	Cannabinoid that modulates many receptors, not psychoactive
Semi-synthetic & synthetics	Lab altered or lab derived

Hsu M, Shah A, Jordan A, Gold MS, Hill KP. Therapeutic Use of Cannabis and Cannabinoids: A Review. *JAMA*. 2026;335(4):345-359. doi:10.1001/jama.2025.19433

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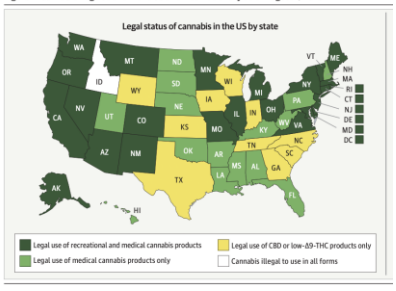
Figure 2. Cannabis Regulations in the US and Internationally as of August 1, 2025



Hsu M, Shah A, Jordan A, Gold MS, Hill KP. Therapeutic Use of Cannabis and Cannabinoids: A Review. *JAMA*. 2026;335(4):345-359. doi:10.1001/jama.2025.19433
Centers for Disease Control and Prevention. State medical cannabis laws. Updated February 16, 2024. Accessed May 6, 2026. https://www.cdc.gov/cannabis/about/state-medical-cannabis-laws.html

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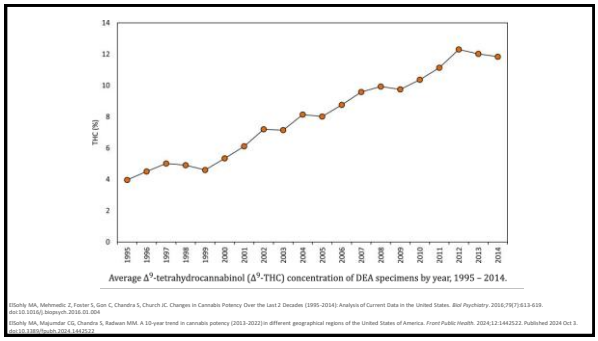

ElSohly MA, Mehmedic Z, Foster S, Gon C, Chandra S, Church JC. Changes in Cannabis Potency Over the Last 2 Decades (1995-2014): Analysis of Current Data in the United States. *Biol Psychiatry*. 2016;79(7):613-619. doi:10.1016/j.biopsych.2016.01.004

ElSohly MA, Majumdar CG, Chandra S, Radwan MM. A 10-year trend in cannabis potency (2013-2022) in different geographical regions of the United States of America. *Front Public Health*. 2024;12:1442522. Published 2024 Oct 3. doi:10.3389/fpubh.2024.1442522

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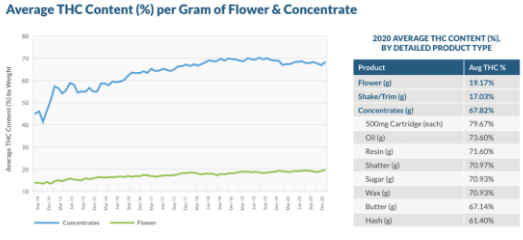

2020 Regulated Marijuana Market Update, Prepared for Colorado Department of Revenue, Marijuana Enforcement Division

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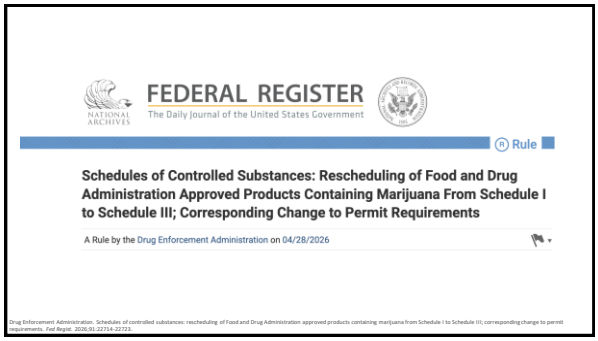

Drug Enforcement Administration. Schedules of controlled substances: rescheduling of Food and Drug Administration approved products containing marijuana from Schedule I to Schedule III; corresponding change to permit requirements. *Fed Regist*. 2026;91:22714-22723.

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Cannabis and Young Children

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Childhood Exposures

- More common
  - Legislative changes
  - Product availability
  - Enticing packaging of edible formulations
- More severe
  - Increased potency & availability of concentrates
  - Synthetic products
  - Naivety
  - Dose dependent effects
  - Immature central nervous system

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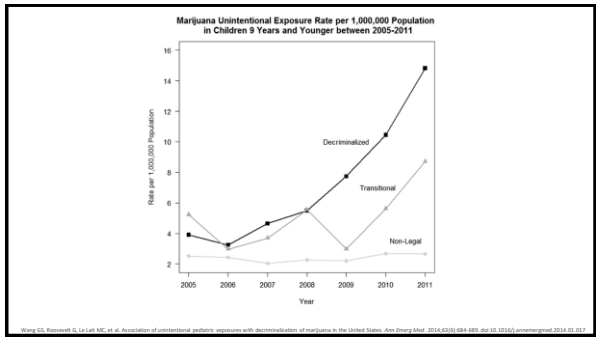

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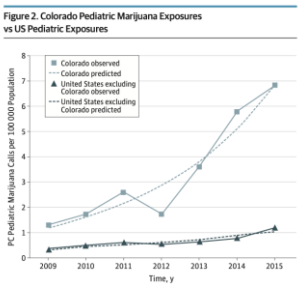

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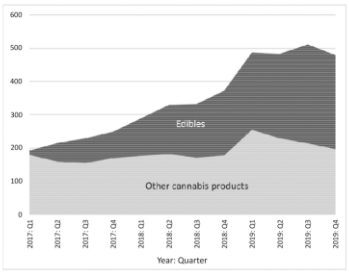

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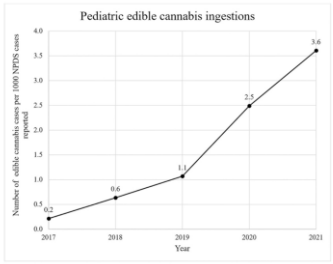

Tweet MS, Nemanich A, Wahl M. Pediatric Edible Cannabis Exposures and Acute Toxicity: 2017–2021. Pediatrics. 2023;151(2):e2022057761

1375.0% increase from 2017 to 2021

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Clinical Manifestations

- Most common
  - CNS depression, ataxia, nausea/vomiting, tachycardia, mydriasis
  - Onset generally within 2-4 hours
- Rare, but more severe
  - Bradycardia, heart block, sinus pauses, asystole
  - Respiratory depression
  - Seizure-like activity

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Risk Stratification

- Edible ingestions → strong predictor of ICU admission
- Ingestion >1.7 mg/kg → severe and prolonged toxicity
  - Prolonged ED observation >6 hours
  - Inpatient admission
- Younger age → respiratory depression
- Synthetics → inconsistent effects
  - Delta 8, Delta 10, HH6

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Long-Term Implications

- Single, acute ingestion or exposure
  - None expected, not well studied
- Second-hand smoke exposure
  - Metabolites detected in children's urine
  - Cannabis smoke contains carcinogens, respiratory irritants, and other harmful chemicals
  - Increase viral respiratory infections
- Impaired caregivers

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Cannabis Use and Adolescence

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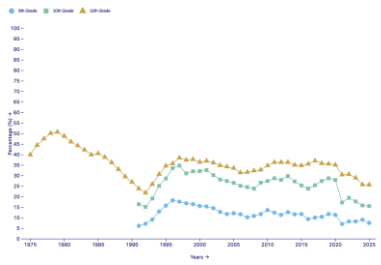
Cannabis: Trends in 12 Month Prevalence of Use in 8th, 10th, and 12th Grade



26% of 12th graders
16% of 10th graders
8% of 8th graders

Miech, R. A., Patrick, M. E., O'Malley, P. M., Jager, J. O. and Jang, J. B. (2026). Monitoring the Future national survey results on drug use, 1975–2025: Overview and detailed results for secondary school students. Monitoring the Future Monograph Series. Ann Arbor, MI: Institute for Social Research, University of Michigan. Available at https://monitoringthefuture.org/results/annual-reports/

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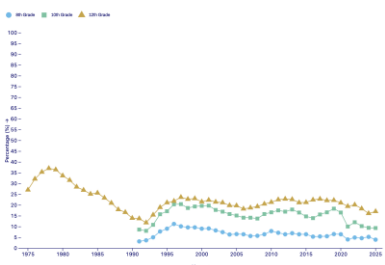
Cannabis: Trends in 30 Day Prevalence of Use in 8th, 10th, and 12th Grade



17% of 12th graders
9% of 10th graders
4% of 8th graders

Miech, R. A., Patrick, M. E., O'Malley, P. M., Jager, J. O. and Jang, J. B. (2026). Monitoring the Future national survey results on drug use, 1975–2025: Overview and detailed results for secondary school students. Monitoring the Future Monograph Series. Ann Arbor, MI: Institute for Social Research, University of Michigan. Available at https://monitoringthefuture.org/results/annual-reports/

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The Adolescent Brain

- Still under development!!!
  - Critical period of neural development
  - Synaptic pruning
- Reward >>> Responsibility
  - Increased risk taking
  - Experimentation

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Cannabis and Brain Development

- Disruptions of Endocannabinoid System
  - Regulation of neurodevelopmental processes
  - Motivational, emotional, and affective processing
- Impaired neural connectivity
  - Precuneus
  - Fimbria (hippocampus → learning and memory)
- Reduced functional connectivity
  - Prefrontal networks → executive functioning
  - Subcortical networks → process habits and routines

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Neurocognitive Effects

- Impaired cognition across numerous domains
  - Executive functioning, processing speed, attention, and memory
- Difficulties with self control
- Poor self-regulation
  - Fighting and impulsive behavior
- Morphologic changes in brain structure
- Interfere with successful transition to adulthood

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Cannabis and Mental Health

- Associated with increased risk for
  - Anxiety
  - Depression
  - Suicidality
  - Psychosis
  - Self-inflicted injury
  - Cannabis use disorder
  - Substance use disorders later in life

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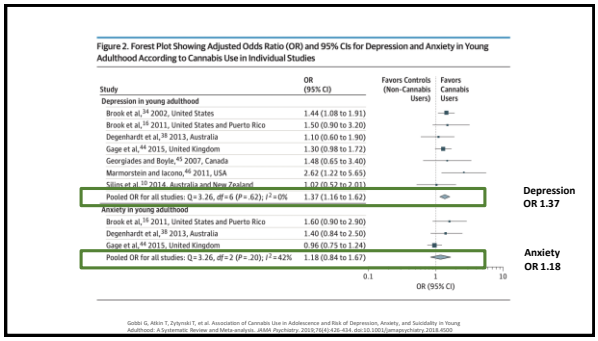

Figure 2. Forest Plot Showing Adjusted Odds Ratio (OR) and 95% CIs for Depression and Anxiety in Young Adulthood According to Cannabis Use in Individual Studies

Study	OR (95% CI)
Depression in young adulthood	
Brook et al,[34] 2002, United States	1.44 (1.08 to 1.91)
Brook et al,[16] 2011, United States and Puerto Rico	1.50 (0.90 to 3.20)
Degenhardt et al,[38] 2013, Australia	1.10 (0.60 to 1.90)
Gage et al,[44] 2015, United Kingdom	1.30 (0.98 to 1.72)
Georgiades and Boyle,[45] 2007, Canada	1.48 (0.65 to 3.40)
Marmorstein and Iacono,[46] 2011, USA	2.62 (1.22 to 5.65)
Silins et al,[10] 2014, Australia and New Zealand	1.02 (0.52 to 2.01)
Pooled OR for all studies: $Q = 3.26$, $df = 6$ ($P = .62$); $I^2 = 0\%$	1.37 (1.16 to 1.62)
Anxiety in young adulthood	
Brook et al,[16] 2011, United States and Puerto Rico	1.60 (0.90 to 2.90)
Degenhardt et al,[38] 2013, Australia	1.40 (0.84 to 2.50)
Gage et al,[44] 2015, United Kingdom	0.96 (0.75 to 1.24)
Pooled OR for all studies: $Q = 3.26$, $df = 2$ ($P = .20$); $I^2 = 42\%$	1.18 (0.84 to 1.67)

Favors Controls (Non-Cannabis Users) | Favors Cannabis Users

0.1 1 10

OR (95% CI)

Depression OR 1.37

Anxiety OR 1.18

Gobbi G, Atkin T, Zytynski T, et al. Association of Cannabis Use in Adolescence and Risk of Depression, Anxiety, and Suicidality in Young Adulthood: A Systematic Review and Meta-analysis. *JAMA Psychiatry*. 2019;76(4):426-434. doi:10.1001/jamapsychiatry.2018.4500

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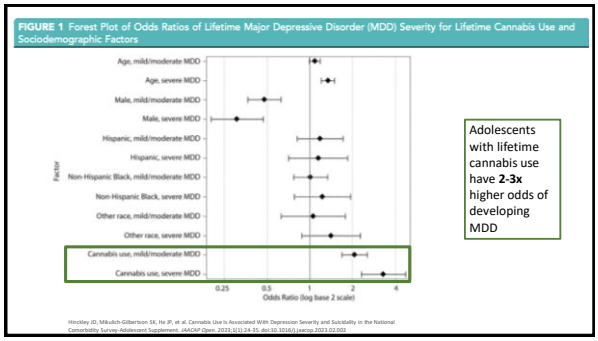

FIGURE 1 Forest Plot of Odds Ratios of Lifetime Major Depressive Disorder (MDD) Severity for Lifetime Cannabis Use and Sociodemographic Factors

Age, mild/moderate MDD
Age, severe MDD
Male, mild/moderate MDD
Male, severe MDD
Hispanic, mild/moderate MDD
Hispanic, severe MDD
Non-Hispanic Black, mild/moderate MDD
Non-Hispanic Black, severe MDD
Other race, mild/moderate MDD
Other race, severe MDD
Cannabis use, mild/moderate MDD
Cannabis use, severe MDD

Factor

0.25 0.5 1 2 4

Odds Ratio (log base 2 scale)

Adolescents with lifetime cannabis use have **2-3x** higher odds of developing MDD

Hinckley JD, Mikulich-Gilbertson SK, He JP, et al. Cannabis Use Is Associated With Depression Severity and Suicidality in the National Comorbidity Survey-Adolescent Supplement. *JAACAP Open*. 2023;1(1):24-35. doi:10.1016/j.jaacop.2023.02.002

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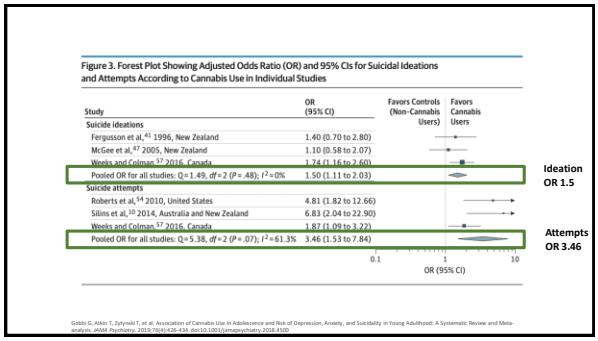

Figure 3. Forest Plot Showing Adjusted Odds Ratio (OR) and 95% CIs for Suicidal Ideations and Attempts According to Cannabis Use in Individual Studies

Study	OR (95% CI)
Suicide ideations	
Fergusson et al,[41] 1996, New Zealand	1.40 (0.70 to 2.80)
McGee et al,[47] 2005, New Zealand	1.10 (0.58 to 2.07)
Weeks and Colman,[37] 2016, Canada	1.24 (1.16 to 2.60)
Pooled OR for all studies: $Q = 1.49$, $df = 2$ ($P = .48$); $I^2 = 0\%$	1.50 (1.11 to 2.03)
Suicide attempts	
Roberts et al,[54] 2010, United States	4.81 (1.82 to 12.66)
Silins et al,[10] 2014, Australia and New Zealand	6.83 (2.04 to 22.90)
Weeks and Colman,[37] 2016, Canada	1.87 (1.09 to 3.22)
Pooled OR for all studies: $Q = 5.38$, $df = 2$ ($P = .07$); $I^2 = 61.3\%$	3.46 (1.53 to 7.84)

Favors Controls (Non-Cannabis Users) | Favors Cannabis Users

0.1 1 10

OR (95% CI)

Ideation OR 1.5

Attempts OR 3.46

Gobbi G, Atkin T, Zytynski T, et al. Association of Cannabis Use in Adolescence and Risk of Depression, Anxiety, and Suicidality in Young Adulthood: A Systematic Review and Meta-analysis. *JAMA Psychiatry*. 2019;76(4):426-434. doi:10.1001/jamapsychiatry.2018.4500

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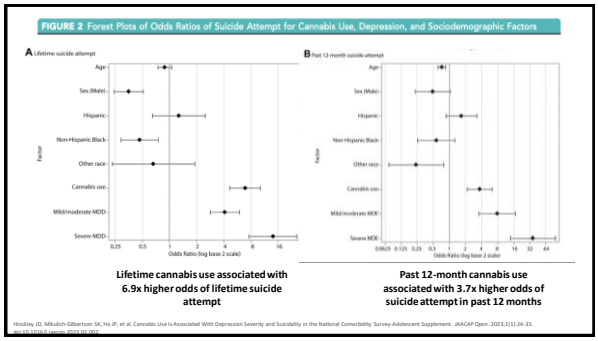

FIGURE 2 Forest Plots of Odds Ratios of Suicide Attempt for Cannabis Use, Depression, and Sociodemographic Factors

A Lifetime suicide attempt

Age
Sex (Male)
Hispanic
Non-Hispanic Black
Other race
Cannabis use
Mild/moderate MDD
Severe MDD

Factor

0.25 0.5 1 2 4 8 16

Odds Ratio (log base 2 scale)

B Past 12-month suicide attempt

Age
Sex (Male)
Hispanic
Non-Hispanic Black
Other race
Cannabis use
Mild/moderate MDD
Severe MDD

Factor

0.0625 0.125 0.25 0.5 1 2 4 8 16 32 64

Odds Ratio (log base 2 scale)

Lifetime cannabis use associated with 6.9x higher odds of lifetime suicide attempt

Past 12-month cannabis use associated with 3.7x higher odds of suicide attempt in past 12 months

Hinckley JD, Mikulich-Gilbertson SK, He JP, et al. Cannabis Use Is Associated With Depression Severity and Suicidality in the National Comorbidity Survey-Adolescent Supplement. *JAACAP Open*. 2023;1(1):24-35. doi:10.1016/j.jaacop.2023.02.002

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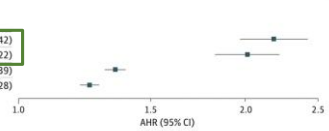
Figure. Forest Plot of Associations of Self-Reported Past-Year Cannabis Use Among 463 396 Adolescents Aged 13 to 17 Years and Incident Psychiatric Disorders Up to Age 26 Years

Outcome	Diagnoses, No.	AHR (95% CI)
Psychotic disorder	4105	2.19 (1.97-2.42)
Bipolar disorder	4061	2.01 (1.82-2.22)
Depressive disorder	62 137	1.34 (1.30-1.39)
Anxiety disorder	73 096	1.24 (1.21-1.28)



Young-Wolff KC, Cortez CA, Alexeeff SE, et al. Adolescent Cannabis Use and Risk of Psychotic, Bipolar, Depressive, and Anxiety Disorders. *JAMA Health Forum*. 2026;7(2):e256839. Published 2026 Feb 6. doi:10.1001/jamahealthforum.2025.6839

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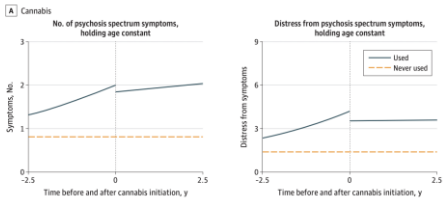
Shared Vulnerability? Self-Medication?

Figure 2. Observed Patterns of Substance Use Initiation and Psychosis Spectrum Symptom Associations



Mammen G, Rueda S, Roerecke M, Bonato S, Lev-Ran S, Rehm J. Association of Cannabis With Long-Term Clinical Symptoms in Anxiety and Mood Disorders: A Systematic Review of Prospective Studies. *J Clin Psychiatry*. 2018;79(4):17r11839. Published 2018 Jun 5. doi:10.4088/JCP.17r11839

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Cannabis and ED/UC Visits

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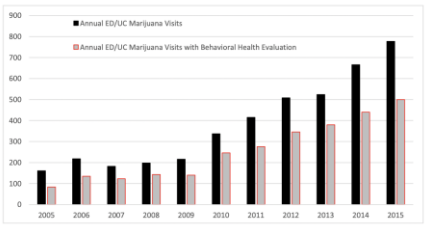

Figure 1. Annual marijuana-related emergency department (ED) and urgent care (UC) visits from a tertiary care children's hospital in Colorado.

Wang GS, Davies SD, Halmo LS, Sass A, Mistry RD. Impact of Marijuana Legalization in Colorado on Adolescent Emergency and Urgent Care Visits. *J Adolesc Health*. 2018;63(2):239-241. doi:10.1016/j.jadohealth.2017.12.010

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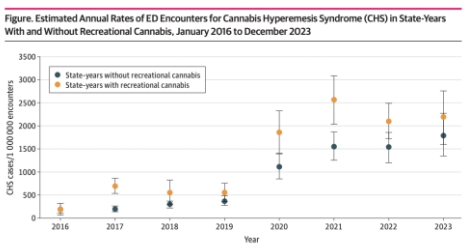

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Cannabis and Other Effects

- Sleep
- Driving
  - Impair driving ability up to 5+ hours after consumption
  - Car accident increases by a factor of ~2
- Sexual Activity
- Pulmonary pathology
- Athletic performance
- Other substance use
  - Nicotine, opioid, and alcohol use

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Cannabis and School

- Impairs critical cognitive functions
  - Acute AND for days after last use
- Lower QI
  - Up to 8 points!
- Increased absenteeism, school drop out rate
- Poorer academic performance, lower GPA
- Less likely to complete high school, get a college degree

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What about “low frequency” use?

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TABLE 2. Adjusted Odds of Adverse Psychosocial Indicators Among Monitoring the Future Adolescent Respondents, by Frequency of Cannabis Use, Nonuse Group as the Control Group[a,b]

		Frequency o	Cannabis Use,[a] aOR (95% CI)		
Adverse Psychosocial Indicator	Nonuse (N = 119 931)	Noncurrent (N = 21 451)	Monthly (N = 7802)	Weekly (N = 5853)	Near Daily (N = 7515)
Academic functioning					
Low GPA	1.00	1.82 (1.72–1.93)	2.20 (2.02–2.39)	2.64 (2.41–2.90)	3.93 (3.61–4.29)
Truancy	1.00	1.75 (1.65–1.87)	2.18 (2.01–2.36)	2.98 (2.70–3.30)	3.75 (3.43–4.11)
No college plans	1.00	1.42 (1.33–1.52)	1.30 (1.17–1.45)	1.63 (1.45–1.83)	2.77 (2.50–3.06)
Social engagement					
No extracurricular activities	1.00	1.26 (1.15–1.39)	1.41 (1.22–1.62)	1.58 (1.35–1.85)	2.34 (2.00–2.74)
No close friends	1.00	1.00 (0.88–1.14)	0.85 (0.70–1.02)	0.87 (0.67–1.13)	1.18 (0.95–1.47)
No social outings	1.00	0.80 (0.76–0.84)	0.62 (0.57–0.67)	0.58 (0.51–0.65)	0.55 (0.50–0.61)
Impulsivity and self-regulation					
Fighting	1.00	1.97 (1.73–2.26)	2.19 (1.82–2.62)	3.08 (2.46–3.85)	3.66 (3.02–4.45)
Danger seeking	1.00	1.47 (1.38–1.57)	1.72 (1.56–1.89)	1.71 (1.52–1.92)	2.00 (1.79–2.23)
Prefers risk-seeking friends	1.00	1.26 (1.14–1.40)	1.40 (1.22–1.61)	1.43 (1.18–1.72)	1.35 (1.15–1.59)
Emotional state					
Anhedonic	1.00	1.39 (1.28–1.51)	1.42 (1.27–1.60)	1.72 (1.49–1.99)	2.04 (1.81–2.30)
Low self-esteem	1.00	1.17 (1.06–1.29)	1.21 (1.04–1.41)	1.50 (1.26–1.79)	1.48 (1.27–1.72)
Anxious	1.00	1.18 (1.08–1.30)	1.11 (0.97–1.27)	1.01 (0.85–1.20)	1.27 (1.09–1.47)
Existential	1.00	1.10 (1.01–1.19)	1.32 (1.17–1.50)	1.11 (0.97–1.27)	1.07 (0.94–1.23)

Sultan RS, Zhang AW, Becker TD, et al. Cannabis Use Among US Adolescents. *Pediatrics*. 2026;157(1):e2024070109. doi:10.1542/peds.2024-070109

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Table 1. Adverse Effects of Short-Term Use and Long-Term or Heavy Use of Marijuana.

Effects of short-term use
Impaired short-term memory, making it difficult to learn and to retain information
Impaired motor coordination, interfering with driving skills and increasing the risk of injuries
Altered judgment, increasing the risk of sexual behaviors that facilitate the transmission of sexually transmitted diseases
In high doses, paranoia and psychosis
Effects of long-term or heavy use
Addiction (in about 9% of users overall, 17% of those who begin use in adolescence, and 25 to 50% of those who are daily users)*
Altered brain development*
Poor educational outcome, with increased likelihood of dropping out of school*
Cognitive impairment, with lower IQ among those who were frequent users during adolescence*
Diminished life satisfaction and achievement (determined on the basis of subjective and objective measures as compared with such ratings in the general population)*
Symptoms of chronic bronchitis
Increased risk of chronic psychosis disorders (including schizophrenia) in persons with a predisposition to such disorders

* The effect is strongly associated with initial marijuana use early in adolescence.

Volkow ND, Baler RD, Compton WM, Weiss SR. Adverse health effects of marijuana use. *N Engl J Med*. 2014;370(23):2219–2227. doi:10.1056/NEJMra1402309

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Cannabis Withdrawal

- Common Symptoms
  - Anxiety
  - Irritability
  - Anger or aggression
  - Sleep difficulty
  - Decreased appetite
  - Restlessness
  - Depressed mood
  - Cravings
- Physical Symptoms
  - Abdominal pain
  - Shakiness/tremors
  - Sweating
  - Fever or chills
  - Headache

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Approach to Management

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SBIRT

- Screening, Brief Intervention, and Referral to Treatment
- Validated screening + appropriate course of action

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Screening Tools

- Screening to Brief Intervention (S2BI)
  - Risk stratification
- Brief Screener for Tobacco, Alcohol, and other Drugs (BSTAD)
  - Risk stratification
- The Car, Relax, Alone, Forget, Friends, Trouble (CRAFFT) screen
  - Can suggest SUD, determines need for assessment
- Tobacco, Alcohol, Prescription medication, and other Substance use (TAPS) Tool
  - Screening +/- brief assessment to determine risk

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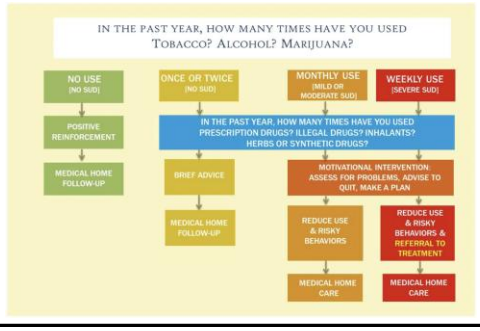

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Counseling & Education

- Peer influence
- Family system influence
  - Modeling
- Harm reduction
  - Screen for co-morbidities
  - Naloxone
- Safe storage

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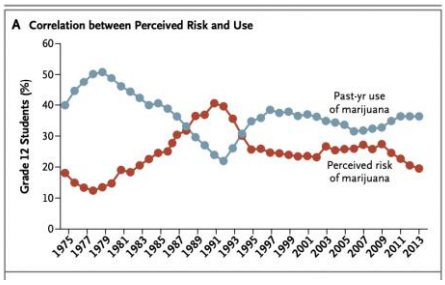

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Parent, Sibling, and Best Friend Influence

Perceived parent use								
Parent medical use only	3.69	1.03	2.13–6.37	<0.001	2.90	1.22	1.27–6.63	0.011
Parent recreational use only	4.93	1.08	3.20–7.56	<0.001	2.10	0.61	1.18–3.70	0.010
Parent medical and recreational use	19.46	6.95	9.66–39.17	<0.001	9.22	5.13	3.09–27.44	<0.001
Unsure	2.58	0.45	1.83–3.61	<0.001	1.38	0.33	0.85–2.18	0.850
Perceived sibling use								0.297
Sibling medical use only	1.29	0.72	0.42–3.87	0.650	0.59	0.39	0.16–2.13	0.418
Sibling recreational use only	4.71	0.66	3.58–6.19	<0.001	2.31	0.43	1.60–3.31	<0.001
Sibling medical and recreational use	27.41	10.26	13.16–57.08	<0.001	12.54	7.07	4.15–37.85	<0.001
Unsure	2.19	0.44	1.48–3.24	<0.001	1.01	0.27	0.59–1.70	0.980
No Siblings	2.06	0.49	1.28–3.29	0.003	1.12	0.38	0.57–2.18	0.729
Perceived best friend use								
Best friend use (any use)	23.19	3.37	17.44–30.82	<0.001	17.28	2.91	12.41–24.03	<0.001

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https://cannabis.colorado.gov/

https://www.coppcap.org/

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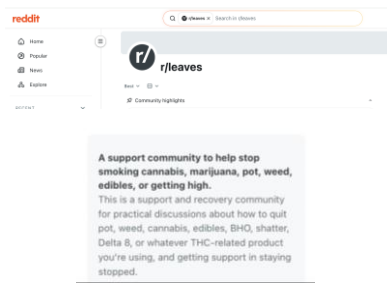

https://www.reddit.com/r/leaves/

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Back to our cases….

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And who to call….

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Approach to Triage

- Call 911
  - Acute medical or psychiatric concerns
  - Threat to themselves or others
- Send to ED
  - Seems anxious or agitated
  - Persistent vomiting, respiratory concerns
- Call Poison Control
  - Accidental ingestion or exposure, minimal to no symptoms
- PCP Follow up
  - Counseling, referrals
  - Concern for co-morbidity
  - Testing

POISON Help 1-800-222-1222

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"We believe treatment and prevention, not jail time, is the healthier approach."

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Take Home Points

- Legal ≠ safe
- Natural ≠ safe
- Cannabis use carries differential risks when exposed across the age and developmental spectrum
- Cannabis use during adolescence impacts neurodevelopment and is strongly associated with morbidity and mortality
- High potency THC changes the risk landscape
- Screening and intervention are key to preventing associated harms

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Questions

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