If you care about youth mental health . . .
you have to care about marijuana and THC use.

Today's marijuana:

Today's marijuana is not just a plant. There are higher profits in processed products, so market share in commercialized states has shifted to concentrates, vaping, and edibles. Some of these products are exponentially more potent than Woodstock weed.

Nationally, the THC concentration in marijuana plants increased threefold between 1995 and 2014 (4% and 12% respectively).[1] The average potency for all products has increased over time in Colorado. Between 2014 and 2020, THC, the psychoactive ingredient in marijuana, increased from 16.4% to 19.2% for bud and from 56.6% to 67.8% for concentrates, according to market reports.[2] Some retail marijuana stores advertise up to 95% THC in concentrate products. Only 7% of products sold in Colorado have a potency lower than 15% THC, the threshold considered high by the Colorado Department of Health and Environment (CDPHE).

Data points:

Teens are using these high potent THC products. A majority of high school students that used marijuana in the past 30 days reported using

[1] Elsohly, M. A., Mehmedic, Z., Foster, S. (2016). Changes in Cannabis Potency Over the Last 2 Decades (1995-2014): Analysis of Current Data in the United States. Biological Psychiatry, 79(7), 613-619. doi:10.1016/j.biopsych.2016.01.004.

[2] Market Size and Demand for Marijuana in Colorado: 2017 Market Update and 2020 Regulated Market Update, Marijuana Policy Group and CU Leeds School of Business.

concentrated THC products including hash oil and wax, according to the 2023 Healthy Kids Colorado Survey.

Today's commercialized, ultra-potent marijuana is entwined with the youth mental health crisis and early deaths. Beginning in 2015, THC has been the number one substance found in toxicology reports for suicides of people ages 10-24 in Colorado, according to the Colorado Violent Death Reporting System. Among 18-24 year olds who died by non-natural deaths excluding homicide from 2010-2021, THC was present in 29% post-mortem toxicology tests compared to 16% with no substance found[3].

Among past year marijuana users aged 12-17, 2 in 5 have a marijuana use disorder.[4] Marijuana (cannabis) use disorder is broadly defined as the inability to stop using marijuana despite negative physical and psychological harm.

Research

Risk of addiction[5]

The risk of developing cannabis use disorder (CUD) has increased since 1992, from approximately 9%[6] to 30%[7] of users. This time period coincides with increasing medical and recreational marijuana legalization in the US, and the

[3] 2024 Report "*Postmortem toxicological presence of THC among Colorado residents younger than 25 years*".
[4] 2023 National Survey on Drug Use and Health, https://www.samhsa.gov/data/report/2023-nsduh-detailed-tables#main-content-start
[5] See generally, Connor JP et al. Cannabis use and cannabis use disorder. Nat Rev Dis Primers. 2021 Feb 25;7(1):16. doi: 10.1038/s41572-021-00247-4, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8655458/#R41.
[6] Anthony JC et al. Comparative epidemiology of dependence on tobacco, alcohol, controlled substances, and inhalants: basic findings from the national comorbidity survey. *Exp. Clin. Psychopharmacol*. 2, 244–268 (1994).
[7] Hasin DS et al. Prevalence of marijuana use disorders in the United States between 2001–2002 and 2012–2013. *JAMA Psychiatry* 72, 1235 (2015).

subsequent increase in potency and availability of the drug and decrease in prices.[8]

Starting marijuana use during adolescence is strongly associated with future marijuana addiction.[9] An Australian study found that initiation of cannabis use before 16 years of age increases the risk of developing CUD.[10]

The risk of progression from cannabis use to CUD increases with frequency of use.[11]

Marijuana use by adolescents is strongly associated with future high-risk use of other substances including alcohol, tobacco, and other illegal drugs like cocaine, ecstasy, opioids, and methamphetamine.[12]

Cannabis use doubles the risk of nonmedical use of prescription opioids and opioid use disorder.[13]

First use of marijuana before age 18 is the greatest predictor of future opioid use disorder, based on a random forest machine learning algorithm applied to the 2016 National Survey on Drug Use and Health.[14]

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[8] Smart R et al. Variation in cannabis potency and prices in a newly legal market: evidence from 30 million cannabis sales in Washington state: legal cannabis potency and price variation. *Addiction* 112, 2167–2177 (2017).
[9] Monitoring Health Concerns Related to Marijuana in Colorado: 2022 Summary.
[10] Butterworth P et al. Factors associated with the timing and onset of cannabis use and cannabis use disorder: results from the 2007 Australian National Survey of Mental Health and Well-Being: predictors of cannabis use and CUD. *Drug Alcohol. Rev*. 33, 555–564 (2014). doi: 10.1111/dar.12183
[11] Hinkley JD et al. The Developmental Trajectory to Cannabis Use Disorder. *Am. J. Psychiatry* 181, 353-358 (2024). doi/10.1176/appi.ajp.20231006.
[12] Monitoring Health Concerns Related to Marijuana in Colorado: 2022 Summary.
[13] Olfson M et al. Cannabis Use and Risk of Prescription Opioid Use Disorder in the United States. *Am J Psychiatry*. 2018 Jan 1;175(1):47-53. doi: 10.1176/appi.ajp.2017.17040413.
[14] Wadekar AS. Understanding Opioid Use Disorder (OUD) using tree-based classifiers. *Drug Alcohol Depend*. 2020 Mar 1;208:107839. doi: 10.1016/j.drugalcdep.2020.107839.

Risk of psychosis

According to a public health statement released by the Colorado Department of Public Health and Environment, "Marijuana use by adolescents and young adults is strongly associated with developing psychotic symptoms in adulthood, such as hallucinations, paranoia and delusional beliefs. The risk is higher with more frequent use and among those who start using marijuana at a younger age."[15]

A Canadian study of health records found that adolescents (aged 12 to 19) who reported past year marijuana use were eleven times more likely to develop a psychotic disorder. And among teens who were hospitalized or visited the Emergency Department due to a psychotic disorder, less than a quarter had not used marijuana in the past year.[16]

A U.K. study confirmed the association with psychosis from cannabis use. Use of high potency THC products (skunk[17]) showed a **3X increased risk** of psychosis while daily use showed a **5X increased risk** of psychosis.[18]

A study based on Danish medical records found an association between CUD and schizophrenia for both males and females, but the magnitude of the association was greater among males. The authors estimated that as many

[15] Monitoring Health Concerns Related to Marijuana in Colorado: 2022 Summary.
[16] McDonald AJ et al. Age-dependent association of cannabis use with risk of psychotic disorder. *Psychological Medicine*. Published online 2024:1-11. doi:10.1017/S0033291724000990
[17] This study relied on analyses of seized cannabis that measured between 12.9-16.2% THC. Most products sold commercially in CO, WA and OR are over 15% THC.
[18] Di Forti M et al. Proportion of patients in south London with first-episode psychosis attributable to use of high potency cannabis: a case control study. *The Lancet Psychiatry* 2, 233-238 (2015). doi:10.1016/S2215-0366(14)00117-5.

as 30% of cases of schizophrenia among men aged 21-30 might have been prevented by averting cannabis use disorder."[19] A different study found that more than a quarter (26.6%) of persons with schizophrenia have current or lifetime CUD.[20]

Acute cannabis-induced psychosis can result in life-long psychotic disorders. An analysis of emergency department visits for substance-induced psychosis found cannabis has the highest transition risk to schizophrenia spectrum disorder. Individuals with cannabis-induced psychosis were at a 242-fold increased risk of transitioning to schizophrenia spectrum disorder, relative to the general population.[21] Younger age and male sex were associated with a higher risk of transition.

Just one psychotic episode following cannabis use was associated with a 47% probability of the individual developing bipolar or schizophrenia disorder. The risk is highest for young people ages 16 to 25, and the risk is higher than for other substances, including alcohol, opioids, amphetamines, and hallucinogens.[22]

[19] Hjorthøj C et al. Association between cannabis use disorder and schizophrenia stronger in young males than in females. *Psychological Medicine*. 2023;53(15):7322-7328. doi:10.1017/S0033291723000880

[20] Hunt GE et al. Prevalence of comorbid substance use in schizophrenia spectrum disorders in community and clinical settings, 1990–2017: systematic review and meta-analysis. *Drug Alcohol Depend*. 191, 234–258 (2018).

[21] Myran DT et al. Transition to Schizophrenia Spectrum Disorder Following Emergency Department Visits Due to Substance Use With and Without Psychosis. *JAMA Psychiatry* 80(11):1169–1174 (2023). doi:10.1001/jamapsychiatry.2023.3582.

[22] Starzer MSK, et al. Rates and Predictors of Conversion to Schizophrenia or Bipolar Disorder Following Substance-Induced Psychosis. *Am J Psychiatry*. 2018 Apr 1;175(4):343-350. doi: 10.1176/appi.ajp.2017.17020223.

Risk of suicide

Marijuana use by adolescents and young adults is associated with an increased likelihood of developing suicidal thoughts or attempting suicide, compared to those who do not use.[23]

An analysis of longitudinal studies from Australia and New Zealand found that daily marijuana use before age 17 was associated with a 7X greater risk of suicide attempt.[24]

Compared to non-users, youth aged 12-17 who used marijuana in the past year or the past month were at twice the risk of major depression and almost twice the risk for suicidal ideation, according to a study using 2015 to 2019 National Survey on Drug Use and Health data.[25]

Risk of other mental health disorders

systematic review and meta analysis of longitudinal studies found an association between adolescent marijuana use and the development of a subsequent anxiety disorder.[26]

There is a risk of co-occurring mental health disorders. CUD in the past year is significantly associated with a higher risk of any mood disorder, anxiety, PTSD,

[23] Monitoring Health Concerns Related to Marijuana in Colorado: 2022 Summary.
[24] Silins E et al. (2014) Young adult sequelae of adolescent cannabis use: an integrative analysis. *Lancet Psychiatry*. doi.org/10.1016/S2215-0366(14)70307-4
[25] Sultan RS, et al. Nondisordered Cannabis Use Among US Adolescents. *JAMA Netw Open.* 2023;6(5):e2311294. doi:10.1001/jamanetworkopen.2023.11294
[26] Lowe, D. J. E., et al. Cannabis use in adolescents and anxiety symptoms and disorders: a systematic review and meta-analysis. *The American Journal of Drug and Alcohol Abuse*, *50*(2), 150–161. (2024). doi.org/10.1080/00952990.2023.2299922

and personality disorder.[27] 12% of persons treated for, or been diagnosed with major depressive disorder had CUD.[28] 20% of persons with bipolar disorder have CUD.[29]

Risk of academic underachievement

Weekly or more frequent marijuana use by adolescents and young adults is associated with impaired learning, memory, math and reading achievement; failure to graduate high school; and failure to attain a college degree.[30]

[27] Hasin DS et al. Prevalence and correlates of DSM-5 cannabis use disorder, 2012–2013: findings from the National Epidemiologic Survey on Alcohol and Related Conditions–III. *Am. J. Psychiatry* 173, 588–599 (2016).
[28] Hunt GE et al. Prevalence of comorbid substance use in major depressive disorder in community and clinical settings, 1990–2019: systematic review and meta-analysis. *J. Affect. Disord*. 266, 288–304 (2020).
[29] Pinto JV et al. The prevalence and clinical correlates of cannabis use and cannabis use disorder among patients with bipolar disorder: a systematic review with meta-analysis and meta-regression. *Neurosci. Biobehav. Rev*. 101, 78–84 (2019).
[30] Monitoring Health Concerns Related to Marijuana in Colorado: 2022 Summary.