

Because perceived harms of cannabis affect youth use, regulators must consider the impact of rescheduling cannabis from Schedule I to Schedule III on youth perceptions and use and design appropriate communications describing health risks

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Nhung Nguyen, PhD, PharmD; Vira Pravosud, PhD; Bonnie Halpern-Felsher, PhD*
Lauren Kass Lempert, JD, MPH; Stella Aguinaga Bialous, DrPH, FAAN;
Pamela M. Ling, MD, MPH

University of California San Francisco
*UCSF and Stanford University

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The Department of Justice has proposed to transfer “marijuana” (we prefer to use the term “cannabis”) from Schedule I to Schedule III of the Controlled Substances Act, based on the view that cannabis has a currently accepted medical use and has a low to moderate abuse potential and level of physical or psychological dependence. However, DOJ and DEA must recognize that perceived harm is associated with substance use and abuse, and changes in product and policy landscapes may impact perceived harms of cannabis use. Therefore, DOJ’s rescheduling of cannabis could lead adolescents and young adults to having decreased perception of the health harms related to cannabis and therefore result in increased use of cannabis.

1. Research has shown that changes in perceived harms of cannabis is associated with increased use.

We conducted a representative panel survey of young adults in California’s Bay Area in 2014 and 2019-2020, before and after cannabis legalization. In that study, we found a significant increase in the prevalence of cannabis use among young adults following legalization. In addition, while perceptions of harm from cannabis did not change over time, increased perceived harm of cannabis was associated with lower odds of cannabis use, and decreased perceived harm

toward cannabis was associated with a higher likelihood of cannabis use.¹ Consistent with our research, other published literature shows that perceiving lower risks of harm is associated with cannabis use among adolescents and young adults.^{2, 3, 4}

In addition to published research, preliminary analysis of our own study of California adolescents and young adults surveyed in 2023 (n=103, age range 14-21) showed that more than half of respondents perceived cannabis vaporizer use safer than nicotine e-cigarette use (53.4%). The perception did not differ significantly by type of products used in the past month: 68% of adolescents who used cannabis and nicotine vapor products perceived cannabis vaporizer use safer than nicotine e-cigarette use, compared to 53% of those who used cannabis vaporizers only, 42% of those who used nicotine e-cigarettes only, and 53% of those who did not use any vapor products in the past month.”⁵ Another study recently accepted for publication showed that among adolescents, young adults, and adults ages 13-40, 38.4% reported use of both tobacco and cannabis in the past 30 days. Even when young people (under age 21) started using tobacco products first, they moved to also using cannabis within 1-2 years.⁶

¹ Nguyen N, Holmes LM, Pravosud V, Cohen BE, Ling PM. Changes in perceived harms of tobacco and cannabis and their correlations with use: A panel study of young adults 2014-2020. *Addict Behav.* 2023 Sep;144:107758. doi: 10.1016/j.addbeh.2023.107758. Epub 2023 May 26. PMID: 37263178; PMCID: PMC10330743.

² Leos-Toro C, Fong GT, Meyer SB, Hammond D. Cannabis health knowledge and risk perceptions among Canadian youth and young adults. *Harm Reduct J.* 2020 Aug 3;17(1):54. doi: 10.1186/s12954-020-00397-w. PMID: 32746859; PMCID: PMC7398180.

³ Wadsworth E, Hammond D. International differences in patterns of cannabis use among youth: Prevalence, perceptions of harm, and driving under the influence in Canada, England & United States. *Addict Behav.* 2019 Mar;90:171-175. doi: 10.1016/j.addbeh.2018.10.050. Epub 2018 Nov 1. PMID: 30412908; PMCID: PMC6324962.

⁴ Balneaves LG, Hammond D, Turner S, Nickel N, Woodgate RL, Watling CZ. Youth and Young Adults' Knowledge and Perceptions of Risks and Benefits Regarding Cannabis Products: A Cross-Sectional Analysis of Over 1,700 Individuals. *J Psychoactive Drugs.* 2024 Jul 1:1-10. doi: 10.1080/02791072.2024.2371028. Epub ahead of print. PMID: 38946663.

⁵ Pravosud et al. Marijuana and nicotine vapor products use among California youth and young adults: cross section survey (*in progress*).

⁶ McCauley, DM, Liu, J., Gaiha, SM, Halpern-Felsher, B. Products and Patterns through Which Adolescents, Young Adults, and Adults Initiate Co-Use of Tobacco and Cannabis. *Addictive Behaviors* (*in press*).

Other studies also show that adolescents' attitudes towards cannabis use are changing, with adolescents' perceived risk of cannabis use steadily declining, permissive attitudes increasing, and disapproval decreasing.^{7, 8, 9} Adolescents often lack a comprehensive understanding of addiction, and fail to recognize the negative outcomes associated with such use.^{10, 11, 12} These attitudes and perceptions are attributable in part to increased positive marketing and social media presence of cannabis products, increased social acceptability,^{13, 14} availability of a wide range of flavored cannabis products,^{15, 16} and legalization of adult use of medical and recreational cannabis in the US.

Although much remains unknown about the negative outcomes of cannabis use, past and emerging research has revealed the harmful effects of cannabis use on youth's health. More

⁷ Parker MA, Anthony JC. Population-level predictions from cannabis risk perceptions to active cannabis use prevalence in the United States, 1991–2014. *Addictive Behaviors*. 2018;82:101-104. doi:10.1016/j.addbeh.2018.02.030

⁸ Roditis ML, Delucchi K, Chang A, Halpern-Felsher B. Perceptions of social norms and exposure to pro-marijuana messages are associated with adolescent marijuana use. *Preventive Medicine*. 2016;93:171-176. doi:10.1016/j.ypmed.2016.10.013

⁹ Mariani AC, Williams AR. Perceived risk of harm from monthly cannabis use among US adolescents: National Survey on drug Use and Health, 2017. *Preventive Medicine Reports*. 2021;23:101436. doi:10.1016/j.pmedr.2021.101436

¹⁰ Roditis ML, Delucchi K, Chang A, Halpern-Felsher B. Perceptions of social norms and exposure to pro-marijuana messages are associated with adolescent marijuana use. *Preventive Medicine*. 2016;93:171-176. doi:10.1016/j.ypmed.2016.10.013

¹¹ Goldberg JH, Millstein S, Schwartz A, Halpern-Felsher B. Intertemporal Tradeoffs: Perceiving the Risk in the Benefits of Marijuana in a Prospective Study of Adolescents and Young Adults. *Med Decis Making*. 2009;29(2):182-192. doi:10.1177/0272989X08323918

¹² Mennis J, McKeon TP, Stahler GJ. Recreational cannabis legalization alters associations among cannabis use, perception of risk, and cannabis use disorder treatment for adolescents and young adults. *Addictive Behaviors*. 2023;138:107552. doi:10.1016/j.addbeh.2022.107552

¹³ Berg CJ, Payne J, Henriksen L, et al. Reasons for Marijuana and Tobacco Co-use Among Young Adults: A Mixed Methods Scale Development Study. *Substance Use & Misuse*. 2018;53(3):357-369. doi:10.1080/10826084.2017.1327978

¹⁴ Thompson L, Rivara FP, Whitehill JM. Prevalence of Marijuana-Related Traffic on Twitter, 2012–2013: A Content Analysis. *Cyberpsychology, Behavior, and Social Networking*. 2015;18(6):311-319. doi:10.1089/cyber.2014.0620

¹⁵ Gammon DG, Gaber J, Lee YO. CBD products that resemble tobacco products enter traditional retail outlets. *Tob Control*. 2021;30(2):237-238. doi:10.1136/tobaccocontrol-2019-055452

¹⁶ Chaffee BW, Couch ET, Wilkinson ML, et al. Flavors increase adolescents' willingness to try nicotine and cannabis vape products. *Drug and Alcohol Dependence*. 2023;246:109834. doi:10.1016/j.drugalcdep.2023.109834

studies are showing the harmful effects of e-cigarette use with cannabis on the respiratory system.¹⁷ In addition to recreational use, youth report using cannabis as self-medication to cope with mental health issues. Our research found that youth perceived cannabis use as beneficial to their mental health.¹⁸ This perception is concerning given that recent national data report an increasing trend in poor mental health in this age group.¹⁹ Furthermore, our recent research using a national sample of US adolescents found that those who use cannabis are at risk for mental health issues, and that adolescents and young adults who were depressed were more likely to use marijuana and co-use marijuana and tobacco.^{20, 21} Likewise, recent reviews indicate that youth's cannabis use is associated with poorer outcomes among those with mood and anxiety disorders²² and increased risk for developing major depression and suicidality²³ Other research indicated the link between cannabis use on brain development long-lasting neuropsychiatric disorders in youth.²⁴ Studies show that cannabis use negatively impacts brain structure and function,

¹⁷ Hamberger, E.S., & Halpern-Felsher, B. Concern over tobacco and marijuana perceptions and use among adolescent and young adults with cystic fibrosis. *Addictive Behaviors*. 2023 Jul;142:107669. PMID: 36921439. DOI: 10.1016/j.addbeh.2023.107669.

¹⁸ Nguyen N, Wong M, Delucchi K, Halpern-Felsher B. Adolescents' and young adults' perceptions of risks and benefits differ by type of cannabis products. *Addict Behav*. 2022 Aug;131:107336. doi: 10.1016/j.addbeh.2022.107336. Epub 2022 Apr 12. PMID: 35436697; PMCID: PMC9240855.

¹⁹ Centers for Disease Control and Prevention, Youth Risk Behavior Survey Data Summary & Trends Report: 2011–2021, 2023. Available: https://www.cdc.gov/yrbs/dstr/pdf/YRBS_Data-Summary-Trends_Report2023_508.pdf

²⁰ Do VV, Ling PM, Chaffee BW, Nguyen N. Concurrent Use of Tobacco and Cannabis and Internalizing and Externalizing Problems in US Youths. *JAMA Netw Open*. 2024;7(7):e2419976. doi:10.1001/jamanetworkopen.2024.19976

²¹ Gaiha, SM, Wang, M., Baiocchi, M, Halpern-Felsher, B. Depression Screening Outcomes among Adolescents, Young Adults, and Adults reporting Past 30-day Tobacco and Cannabis Use. *Addictive Behaviors*. 2024, v 156.

²² Hammond CJ, Chaney A, Hendrickson B, Sharma P. Cannabis use among U.S. adolescents in the era of marijuana legalization: a review of changing use patterns, comorbidity, and health correlates. *Int Rev Psychiatry*. 2020 May;32(3):221-234. doi: 10.1080/09540261.2020.1713056. Epub 2020 Feb 6. PMID: 32026735; PMCID: PMC7588219.

²³ Gobbi G, Atkin T, Zytynski T, Wang S, Askari S, Boruff J, Ware M, Marmorstein N, Cipriani A, Dendukuri N, & Mayo N (2019). Association of Cannabis Use in Adolescence and Risk of Depression, Anxiety, and Suicidality in Young Adulthood: A Systematic Review and Meta-analysis. *JAMA Psychiatry*, 76(4), 426–434. doi:10.1001/jamapsychiatry.2018.4500

²⁴ Hammond CJ, Chaney A, Hendrickson B, Sharma P. Cannabis use among U.S. adolescents in the era of marijuana legalization: a review of changing use patterns, comorbidity, and health correlates. *Int Rev Psychiatry*. 2020 May;32(3):221-234. doi: 10.1080/09540261.2020.1713056. Epub 2020 Feb 6. PMID: 32026735; PMCID: PMC7588219.

especially with early age of onset and prolonged use, and can lead to adverse cognitive outcomes such as poor attention span, impaired learning and problem-solving, and interference with educational and economic outcomes.^{25, 26}

2. DEA and DOJ should design its communications around the rescheduling of cannabis to ensure that youth understand the health harms associated with its use.

Among U.S. adults, youth cannabis smoking has become more socially acceptable compared to tobacco smoking.^{27, 28} Perceived parental acceptance and approval of cannabis use following cannabis legalization may be associated with the increased cannabis use among adolescents.²⁹

²⁵ National Academies of Sciences, Engineering, and Medicine (U.S.), ed. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*. The National Academies Press; 2017.

²⁶ Macleod J, Oakes R, Copello A, et al. Psychological and social sequelae of cannabis and other illicit drug use by young people: a systematic review of longitudinal, general population studies. *The Lancet*. 2004;363(9421):1579-1588. doi:10.1016/S0140-6736(04)16200-4

²⁷ Chambers J, Keyhani S, Ling PM, et al. Perceptions of Safety of Daily Cannabis vs Tobacco Smoking and Secondhand Smoke Exposure, 2017-2021. *JAMA Network Open*. 2023;6(8):e2328691-e2328691. doi:10.1001/jamanetworkopen.2023.28691

²⁸ Liu, J, McCauley, D, Gaiha, S, Halpern-Felsher, B. Perceptions of harm and addictiveness for nicotine products, THC e-cigarettes, and e-cigarettes with other ingredients among adolescents, young adults, and adults. *Substance Use and Misuse (in press)*.

²⁹ Friese B, Grube JW. Legalization of medical marijuana and marijuana use among youths. *Drugs: education, prevention and policy*. 2013 Feb 1;20(1):33-9.

Evidence from past and emerging research demonstrates negative health impacts of cannabis.^{30, 31, 32, 33, 34, 35, 36}

Early cannabis use³⁷ also has been linked to increased risk of cannabis use disorder. Another concerning trend is the increasing cannabis and tobacco co-use among adolescents³⁸ and potentially higher health risks associated with it.^{39, 40, 41} A 2022-2023 prospective study of adolescents found that cannabis use was associated with increased odds of persistent use of e-cigarettes or any nicotine product at follow up, and the authors call for cannabis use prevention

³⁰ Hamberger ES, Halpern-Felsher B. Vaping in adolescents: epidemiology and respiratory harm. *Curr Opin Pediatr.* 2020 Jun;32(3):378-383. PMID: 32332328 PMCID: PMC7285995. DOI: 10.1097/MOP.0000000000000896.

³¹ Gilbert PA, Kava CM, Afifi R. High-School Students Rarely Use E-Cigarettes Alone: A Sociodemographic Analysis of Polysubstance Use Among Adolescents in the United States. *Nicotine & Tobacco Research.* 2021;23(3):505-510. doi:10.1093/ntr/ntaa037

³² Ross JA, Levy S. The Impact of Cannabis Use on Adolescent Neurodevelopment and Clinical Outcomes Amidst Changing State Policies. *Clinical Therapeutics.* 2023;45(6):535-540. doi:10.1016/j.clinthera.2023.03.009

³³ Miller AP, Baranger DAA, Paul SE, et al. Characteristics Associated With Cannabis Use Initiation by Late Childhood and Early Adolescence in the Adolescent Brain Cognitive Development (ABCD) Study. *JAMA Pediatr.* 2023;177(8):861. doi:10.1001/jamapediatrics.2023.1801

³⁴ Van Gastel WA, Tempelaar W, Bun C, et al. Cannabis use as an indicator of risk for mental health problems in adolescents: a population-based study at secondary schools. *Psychol Med.* 2013;43(9):1849-1856. doi:10.1017/S0033291712002723

³⁵ National Academies of Sciences, Engineering, and Medicine (U.S.), ed. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research.* The National Academies Press; 2017.

³⁶ Macleod J, Oakes R, Copello A, et al. Psychological and social sequelae of cannabis and other illicit drug use by young people: a systematic review of longitudinal, general population studies. *The Lancet.* 2004;363(9421):1579-1588. doi:10.1016/S0140-6736(04)16200-4

³⁷ Leung J, Chan GCK, Hides L, Hall WD. What is the prevalence and risk of cannabis use disorders among people who use cannabis? a systematic review and meta-analysis. *Addictive Behaviors.* 2020/10/01/ 2020;109:106479.

³⁸ McCauley, DM, Liu, J., Gaiha, SM, Halpern-Felsher, B. Products and Patterns through Which Adolescents, Young Adults, and Adults Initiate Co-Use of Tobacco and Cannabis. *Addictive Behaviors, (in press).*

³⁹ Osman A, Kowitz SD, Ranney LM, Heck C, Goldstein AO. Risk factors for multiple tobacco product use among high school youth. *Addict Behav;* 2019;99:106068 doi:10.1016/j.addbeh.2019.106068. PMID:PMC6791764.

⁴⁰ Smith CL, Cooper BR, Miguel A, Hill L, Roll J, McPherson S. Predictors of cannabis and tobacco co-use in youth: exploring the mediating role of age at first use in the population assessment of tobacco health (PATH) study. *Journal of Cannabis Research;* 2021;3(1):16 doi:10.1186/s42238-021-00072-2

⁴¹ Gaiha, SM, Wang, M., Baiocchi, M, Halpern-Felsher, B. Depression Screening Outcomes among Adolescents, Young Adults, and Adults reporting Past 30-day Tobacco and Cannabis Use. *Addictive Behaviors.* 2024

to help inhibit persistent nicotine use and its public health burdens.⁴² Given these findings, it is urgent for DEA and DOJ to design communications to increase perceived harms of cannabis use among youth as well as among their parents and guardians.

Prevention and intervention efforts should focus on communicating the negative impacts of cannabis use. Our research highlights a need for correcting youth's misperceptions regarding the benefits of cannabis use and educating adults and young adults on mental health risks related to the use of cannabis. In addition, including screening for mental health problems into routine clinical care and integrating resilience training (e.g., family or school support) in prevention programs may offer youth better ways to cope with their mental health issues,⁴³ which in turn may prevent their cannabis use. Well-designed communications that increase youth and adult awareness about health risks (e.g., brain impairment, mental health disorders), social risks (e.g., losing friends or impacting family relationships), and the addictive nature of cannabis use may help deter youth cannabis use.^{44, 45}

Conclusions:

Current research demonstrates:

- Youth's perceptions of cannabis are a major driver of use, with low perceived harms associated with initiation and continued use of cannabis.

⁴² Han DH, Harlow AF, Bae D, Cho J, Eckel SP, McConnell R, Barrington-Trimis JL, Audrain-McGovern JE, Leventhal AM. Association between cannabis use and nicotine use persistence among adolescents. *Addictive Behaviors*. 2024 Nov 1;158:108106.

⁴³ Mesman E, Vreeker A, & Hillegers M (2021). Resilience and mental health in children and adolescents: An update of the recent literature and future directions. *Current Opinion in Psychiatry*, 34(6), 586–592.

⁴⁴ Skinner ML, Haggerty KP, Casey-Goldstein M, Thompson RW, Buddenberg L, Mason WA. Focus Groups of Parents and Teens Help Develop Messages to Prevent Early Marijuana Use in the Context of Legal Retail Sales. *Subst Use Misuse*. 2017 Feb 23;52(3):351-358. doi: 10.1080/10826084.2016.1227847. Epub 2016 Oct 21. PMID: 27768528; PMCID: PMC5241239.

⁴⁵ Liu J, Gaiha SM, Halpern-Felsher B. A breath of knowledge: overview of current adolescent e-cigarette prevention and cessation programs. *Current Addiction Reports*. 2020 Dec;7:520-32.

- Concurrent with the rise in use, youth’s perceived harms of cannabis have declined over the past decade.
- The expanding legalization of cannabis nationwide may increase acceptability and ease of access among youth.
- Cannabis use among youth poses concerns of negative health effects on brain development and mental function
- Communication targeting preventing cannabis use among this developmental age group is of public health importance.

Based on this scientific evidence, DEA and DOJ should not discount the risk of the potential negative physical, mental, and social consequences of federal changes in cannabis laws, policies, and regulations on youth, and policy changes such as the rescheduling of cannabis from Schedule I to Schedule III “should apply a *public health framework* and consider the possible downstream effects of marijuana policy change on pediatric health.”⁴⁶

⁴⁶ Hammond CJ, Chaney A, Hendrickson B, Sharma P. Cannabis use among U.S. adolescents in the era of marijuana legalization: a review of changing use patterns, comorbidity, and health correlates. *Int Rev Psychiatry*. 2020 May;32(3):221-234. doi: 10.1080/09540261.2020.1713056. Epub 2020 Feb 6. PMID: 32026735; PMCID: PMC7588219.