Marijuana use significantly increased and its perceived harm decreased among eighth- and 10th-graders in Washington state following enactment of recreational marijuana laws, according to a UC Davis and
Columbia University Mailman School of Public Health to be published online in *JAMA Pediatrics*. There was no change in use or perceived harm among 12th graders or among similar grades in Colorado.

The authors believe the study is the first in the nation to assess changes in teens' perceptions and marijuana use before and after legalized recreational use, and compare these attitudes and use in 45 other contiguous states where marijuana use is not legal.

The data showed that legalization of recreational marijuana use significantly reduced perceptions of marijuana's harmfulness by 14 percent and 16 percent among eighth and 10th graders and increased their past-month marijuana use by 2 percent and 4 percent in Washington state but not in Colorado.

Among states without legalized marijuana use, the perceived harmfulness also decreased by 5 percent and 7 percent for students in the two grades, but marijuana use decreased by 1.3 percent and .9 percent. Among older adolescents in Washington state and all adolescents surveyed in Colorado, there were no changes in perceived harmfulness or marijuana use in the month after legalization.

The researchers compared data on the perceived harmfulness of marijuana use to health and self-reported marijuana use for nearly 254,000 Colorado and Washington state students in the eighth, 10th and 12th grades who participated in the Monitoring the Future survey.

The survey measures drug, alcohol and cigarette use and related attitudes among adolescent students nationwide. The authors compared Washington and Colorado with 45 other states in the contiguous U.S. that did not legalize recreational marijuana use. In a sensitivity analysis, they also compared Washington and Colorado data with 20 states with *medical marijuana laws* but no recreational marijuana laws; results were
unchanged.

The investigators attribute the lack of change in attitudes and marijuana use among teens in Colorado after legalization to a more robust commercialization effort prior to the law taking effect.

Colorado had very developed medical marijuana dispensary systems before recreational use became legal, with substantial advertising which youth were exposed to. Colorado also had lower rates of perceived harmfulness and higher rates of use compared to Washington state and other states where recreational use is not legal.

"While legalization for recreational purposes is currently limited to adults, potential impacts on adolescent marijuana use are of particular concern," said Magdalena Cerdá, an epidemiologist with the UC Davis Violence Prevention Research Program and first author of the study.

"Some adolescents who try marijuana will go on to chronic use, with an accompanying range of adverse outcomes, from cognitive impairment to downward social mobility, financial, work-related and relationship difficulties. We need to better understand the impact of recreational marijuana use so we're better prepared to prevent adverse consequences among the most vulnerable sectors of the population," Cerdá said.

While more targeted research is needed to determine the influence of legalized recreational marijuana use among adolescents and how well the Washington state and Colorado experiences can be generalized to the rest of the U.S., the authors believe that states considering legalized recreational use may also want to consider investing in evidence-based substance abuse prevention programs for adolescents.

The potential effect of legalizing marijuana for recreational use has been a topic of considerable debate since Washington and Colorado first
legalized its use for adults in 2012. Alaska, Oregon and Washington, D.C., followed suit in 2014, and voters in California, Massachusetts and Nevada approved recreational use this past November.

"The perceived harmfulness of marijuana has declined sharply in the U.S. in the last few years, despite the fact that there are adverse consequences associated with marijuana use in some adults and in adolescents," said Deborah Hasin, a professor of epidemiology at Columbia University's Mailman School of Public Health and in psychiatry at Columbia University and principal investigator of the study.

"Epidemiologic monitoring of these consequences as more states legalize recreational use, and public education about potential health consequences, are important to protect public health," Hasin said.

Cerdá noted that the study suggests that legalization of marijuana in Washington reduced stigma and perceived risk of use, which could explain why younger adolescents are using more marijuana after legalization.

"Other potential reasons for the increase in use include increased access to marijuana through third-party purchases, and lower price," Cerdá said. "Older adolescents may also have had their attitudes and beliefs about marijuana formed before recreational marijuana use was legalized, making it less likely their use would change after legalization."


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