

VIEWPOINT

Will Legalization and Commercialization of Cannabis Use Increase the Incidence and Prevalence of Psychosis?

Robin M. Murray, MD
Institute of Psychiatry,
Psychology, and
Neuroscience,
Department of
Psychosis Studies,
King's College, London,
United Kingdom.

Wayne Hall, PhD
Centre for Youth
Substance Abuse
Research, The
University of
Queensland, Brisbane,
Australia.

There is a worldwide trend toward liberalizing cannabis policy and commercializing its sale. Uruguay legalized recreational cannabis in 2013, as did Canada in 2018, as well as 10 US states.¹ Other countries have decriminalized the drug. In Holland, cannabis can be bought in designated cafes, and in Portugal, the police refer those who regularly use cannabis for counseling. Psychiatrists have played a prominent role in the debate over the health consequences of legalization in many countries, especially in the UK, but the public debate in the US has been notable for the absence of input from psychiatrists.²

Tetrahydrocannabinol is responsible for the “high” that those who use cannabis enjoy. The proportion of tetrahydrocannabinol in cannabis has risen from 3% or less in many traditional herbal forms to an average of 10% to 15% in Europe and North America.^{1,3} In Colorado, the first state to legalize recreational use, potency has spiraled upwards of 70% with tetrahydrocannabinol content in shatter (solid cannabis extract) and wax dabs (soft, honeylike cannabis extract).

In those US states that have legalized cannabis, the price has fallen¹ and both cannabis use and dependence have increased among adults.^{1,3,4} The risk of dependence among those who use cannabis was estimated at 9% in the early 1990s but has increased along with potency, with 1 report suggesting it is now closer to 30%.³ Unintentional overdoses and driving while intoxicated have significantly increased. There is concern about the effects of cannabis on the unborn child, particularly since many women appear to use cannabis during pregnancy to counteract nausea.⁵ Those who actively use cannabis show cognitive impairment while they are intoxicated, but it is unclear whether the effects persist after they stop using cannabis.

There are some reports that cannabis use increases risk of depression and suicide,⁶ but by far the strongest evidence concerns psychosis. Numerous prospective studies have shown that cannabis use carries an increased risk of later schizophrenia-like psychosis.^{2,6} Sideli et al⁶ state that “...systematic reviews and methodologically robust studies have confirmed the important role of cannabis use in the initiation and persistence of psychotic disorders.” Indeed, of 13 prospective longitudinal studies, 10 showed that those who use cannabis had a significantly increased risk of psychosis compared with those who do not, while 2 of the remaining 3 showed a trend in the same direction.⁶

Cannabis potency is considered high if it contains greater than 10% tetrahydrocannabinol. There is a dose-response relationship in those who use high-potency cannabis moderately (the risk doubles), heavily (it increases 5-fold), and daily (it increases up to 9-fold).⁷ The latter relative risk is similar to the risk of lung cancer in

those who smoke 30 cigarettes per day. Those individuals who have a family history of psychosis and those who begin using cannabis in adolescence (which is only too common) appear especially vulnerable. Patients diagnosed with psychosis who continue to use cannabis have a worse prognosis than those who cease to use it, with more frequent episodes and longer periods of hospitalization for their illnesses.⁶

Critics have proposed a number of alternative explanations to the causal hypothesis, but one by one, these have been rebutted.⁶ Confounding by other drug use or by prior psychological deviancy does not negate the effect of cannabis.⁶ It was hypothesized that patients may use cannabis to counteract symptoms of psychosis, or even allay anxiety in the prodrome, but empirical data do not support this hypothesis.⁶

A more pertinent criticism of the causal hypothesis is that those who are genetically predisposed to schizophrenia might be more likely to use cannabis than the rest of the population. Some studies suggest that a small proportion of variance in initiating cannabis use may be explained by such genetic predisposition—others disagree. However, if there is any effect, it is small and cannot explain the strong association between the daily use of high-potency cannabis and later psychosis.⁶

It is often forgotten that tobacco was initially considered a harmless, natural plant. Health problems only came to the fore after the tobacco industry invented cigarettes for ease of use, mass-produced them, and marketed them using persuasive advertising. Cigarette prices plummeted and governments were seduced by the employment and tax income generated. A skillful campaign even persuaded many psychiatrists that smoking cigarettes could counteract the cognitive impairment in schizophrenia.

In a similar manner, the legalization of cannabis production and sale has created a rapidly growing industry with a strong financial interest in promoting cannabis use. As a result, commercialization of cannabis is now rampant, and a dazzling array of cannabis products in the form of ice cream, cakes, and sweets is available. A recent report projected annual legal sales of cannabis at \$66.3 billion by 2025. Tobacco and alcohol companies are buying into the industry.³ Sophisticated lobbying and marketing by the cannabis industry highlights the tax revenue for governments and the health benefits of “medical use.” As with the first reports more than 60 years ago of a causal association between cigarette smoking and lung cancer, the cannabis industry denies or minimizes the evidence that cannabis use increases the risk of psychosis.

The long-term adverse effects of tobacco and alcohol track the extent of their use, both of which are

Corresponding Author: Robin M. Murray, MD, Institute of Psychiatry, Psychology and Neuroscience, Department of Psychosis Studies, King's College, De Crespigny Park, London SE5 8AF, United Kingdom (robin.murray@kcl.ac.uk).

strongly influenced by their price and availability. Lung cancer reached epidemic proportions after cigarette smoking spread, and the frequency of alcoholic liver disease waxes and wanes in proportion to changes in population alcohol consumption.

Growing evidence suggests that this is also the case for cannabis and psychosis. Boydell et al⁸ showed that the incidence of schizophrenia doubled in London, England, between 1965 and 1999 and attributed much of this to the increased use of cannabis. Hjorthøj et al⁹ demonstrated that the incidence of cannabis-induced psychosis more than doubled in Denmark between 2006 and 2016. Gonçalves-Pinho et al¹⁰ reported that rates of hospitalization for psychotic disorders in Portugal increased 29-fold in the 15 years after decriminalization; the percentage of patients with a psychotic disorder and documented cannabis use rose from 0.87% to 10.60%.

Di Forti and colleagues⁷ found that the incidence rate of psychosis in 11 areas across 5 countries in Europe was highly positively correlated (Pearson $r = 0.8$; $P = .01$) with the prevalence of daily cannabis use in the general population in each site. They calculated the population attributable fraction of first-episode psychosis attributed

to cannabis to be 12% across their sites as a whole. However, the population attributable fraction was greatest in the 2 cities with the highest-potency cannabis, London and Amsterdam, where it was estimated that 30% and 50% of new cases of psychosis, respectively, would be prevented if no one smoked high-potency cannabis.

Is it inevitable that legalization of recreational cannabis will result in more dependence and psychosis? In theory, it is possible to legalize cannabis in ways that do not increase potency and prevalence of use but, so far, experience with commercialization in North America is not encouraging. Governments that decide to legalize cannabis should use some of the tax revenue to monitor cannabis price, consumption, and potency levels and to carefully evaluate the long-term repercussions for mental health in different US states and Canadian provinces. Such monitoring would enable policies to be developed to minimize harm. In the absence of such an approach, it seems likely that the current commercialization of recreational cannabis in North America will be followed in a few years by a rise in the incidence of new cases of psychosis and in the prevalence of people with more chronic psychoses.

ARTICLE INFORMATION

Published Online: April 8, 2020.

doi:10.1001/jamapsychiatry.2020.0339

Conflict of Interest Disclosures: None reported.

REFERENCES

- Hall W, Stjepanović D, Caulkins J, et al. Public health implications of legalising the production and sale of cannabis for medicinal and recreational use. *Lancet*. 2019;394(10208):1580-1590. doi:10.1016/S0140-6736(19)31789-1
- Berenson A. *Tell Your Children: The Truth About Marijuana, Mental Illness and Violence*. Free Press; 2019.
- Hasin DS. US epidemiology of cannabis use and associated problems. *Neuropsychopharmacology*. 2018;43(1):195-212. doi:10.1038/npp.2017.198
- Cerdá M, Mauro C, Hamilton A, et al. Association between recreational marijuana legalization in the United States and changes in marijuana use and cannabis use disorder from 2008 to 2016. *JAMA Psychiatry*. Published online November 13, 2019. doi:10.1001/jamapsychiatry.2019.3254
- Surgeon general releases advisory on marijuana use and the developing brain. US Department of Health & Human Services. Published August 29, 2019. Accessed February 28, 2020. <https://www.hhs.gov/about/news/2019/08/29/surgeon-general-releases-advisory-marijuana-damaging-effects.html>
- Sideli L, Quigley H, La Cascia C, Murray RM. Cannabis use and the risk for psychosis and affective disorders. *J Dual Diagn*. 2020;16(1):22-42. doi:10.1080/15504263.2019.1674991
- Di Forti M, Quattrone D, Freeman TP, et al. The contribution of cannabis use to variation in the incidence of psychotic disorder across Europe (EU-GEI): a multicentre case-control study. *Lancet Psychiatry*. 2019;6(5):427-436. doi:10.1016/S2215-0366(19)30048-3
- Boydell J, van Os J, Caspi A, et al. Trends in cannabis use prior to first presentation with schizophrenia, in South-East London between 1965 and 1999. *Psychol Med*. 2006;36(10):1441-1446. doi:10.1017/S0033291706008440
- Hjorthøj C, Larsen MO, Starzer MSK, Nordentoft M. Annual incidence of cannabis-induced psychosis, other substance-induced psychoses and dually diagnosed schizophrenia and cannabis use disorder in Denmark from 1994 to 2016. *Psychol Med*. Published online December 16, 2019. doi:10.1017/S0033291719003532
- Gonçalves-Pinho M, Bragança M, Freitas A. Psychotic disorders hospitalizations associated with cannabis abuse or dependence: a nationwide big data analysis. *Int J Methods Psychiatr Res*. Published online December 5, 2019. doi:10.1002/mpr.1813