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Editorial

Contextualizing Cannabis Legalization Outcomes

Cannabis ("marijuana") has a long history of legality and prohibition in the United States. However, it has been federally illegal since the 1970s Controlled Substances Act. The Controlled Substances Act currently categorizes cannabis as a schedule I substance, the most restrictive schedule, quantifying cannabis on par with heroin and indicating a high potential for abuse, no currently accepted medicinal use, and lack of safety for use under medical supervision [1].

Federal scheduling has created obstacles for research, constraining what we currently understand about cannabis. Despite federal illegality, states and local jurisdictions have enacted three broad categories of cannabis policies: (1) decriminalization, replacing criminal sanctions with civil fines; (2) medicinal cannabis legalization (MCL) and regulation for medicinal use; and (3) adult-use ("recreational") cannabis legalization (AUCL) and regulation for nonmedical use for adults 21 years of age or older. Legalization as a state-level phenomenon has resulted in a heterogeneous patchwork of policies and provisions across states (i.e., allowance for home cultivation, dispensaries, purchasing limits,and so on), further complicating research on outcomes.

One potential consequence of cannabis legalization is an increase in acute or long-term health problems, particularly among vulnerable populations such as adolescents and persons with behavioral health disorders [2]. Cannabis legalization policies preceded scientific knowledge. Thus, policymakers have few evidence-based options to weigh when enacting legalization and subsequent strategies to protect the health and safety of their constituents, such as preventing adolescent diversion and regulating potency.

To contextualize the study by Masonbrink et al in the realm of cannabis policy research today, the following two recent federal activities are important to highlight:

- In May 2021, the National Institute on Drug Abuse and select National Institute of Health agencies established a standard unit of 5 milligrams of tetrahydrocannabinol, the main psychoactive component of the cannabis plant, to be used for human research. The purpose of this standardization is to allow for greater comparability between studies to move scientific knowledge forward. Research following this guidance may help states evaluate any evidence basis for potency caps for regulated products, which could reduce some clinical ramifications of use, especially for adolescents [3].
- In July 2021, Senate Majority Leader Chuck Schumer proposed *The Cannabis Administration and Opportunity Act,* a bill that includes the removal of cannabis from Controlled Substances Act scheduling, as well as a legislatively mandated research agenda on societal impacts of AUCL, including cannabis-related hospital admissions and poison control center calls. This legislation, if enacted, would help facilitate research to better understand the myriad of effects of cannabis legalization, as well as insert federal government leadership in this area [4].

Regarding social impacts, research has, to date, relied on the quasiexperimental design of changing cannabis policy to assess outcomes. Multistate studies best leverage these "laboratories of democracy" to improve our collective understanding, controlling for state and year trends as best as empirical methodology permits.

Public health and safety are leading concerns in legalizing cannabis for medicinal or nonmedical adult use. At the forefront of these discussions are the potential impact(s) on adolescents. A common misperception among youth is that cannabis use is without harm. However, adolescent cannabis use may have measurable, durable, and potentially irreversible effects on later cognitive function and mental health [5].

While neither MCL nor AUCL changed the legality of cannabis for adolescents (excluding certain patients younger than 18 years of age with qualifying medical conditions), legalization could affect adolescent perceptions of cannabis or alter access and potency of products [6]. Fortunately, concern that MCL could be associated with increased adolescent cannabis use appears not to play out in the short term, but effects for adolescents may lag as markets mature and saturate [7]. AUCL literature is still evolving; however, early short-term findings regarding adolescent use changes are mixed [7].

In a novel study published in this issue of the journal, Masonbrink et al [8] examine whether cannabis-related hospi-

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talizations for adolescents (11–17 years) increased after states enacted MCL and AUCL. Using cannabis-related diagnosis data from 82 tertiary care children's hospitals across 33 states (plus D.C.), researchers report an increased likelihood of cannabis-related hospitalizations among adolescents living in states with AUCL in the years after legalization.

In contrast, a recent study of youth hospitalizations in Quebec, Canada, found no difference in cannabis-related hospitalizations from prelegalization to postlegalization in adolescents aged 15–19 years but observed an increase among boys aged 10–14 years [9]. Differences between study findings could, in part, reflect the policy, implementation, and regulatory differences between jurisdictions. More work is needed to isolate drivers of cannabis-related hospitalizations. As evidence matures, foci on comprehensive monitoring of hospital utilization for cannabis-related incidents among adolescents may be critical.

The work by Masonbrink et al presents multiple strengths. Contrary to most studies using large, multistate samples, which typically assess changes in cannabis-use patterns, this study assesses cannabis-related hospitalizations, a more serious outcome. As enactment-to-implementation timelines and mechanisms vary across legalized states, effects may be varied and lagged. This study uses a one-year washout period to account for some differences in the enactment of legalization.

Importantly and as Masonbrink et al. note, hospitalization outcomes are particularly challenging to assess because legalization could increase honesty in reporting cannabis use and increased attention to cannabis could result in greater documentation and more use of cannabis-related service codes. Nonetheless, hospitalizations are among the most severe unintended consequences from legalization. These and other more severe adverse public health and safety outcomes postcannabis policy implementation are missed by research focusing solely on "use" (i.e., frequency/quantity) trends.

Future research should continue to consider and expand attention on policy heterogeneity, which may help isolate differences in legalization provisions contributing to adverse effects. For example, presence of retail markets, density of markets, enforcement of adolescent diversion provisions, and other key policy and regulatory differences could influence outcomes related to hospital admissions [10].

As this body of research progresses, it will be helpful to understand where adolescents are accessing cannabis, which can range from the illicit market (i.e., illegally produced and sold), legal market, or through products diverted from the legal market (i.e., "gray market"). This future work could provide additional compelling evidence for policy makers and regulators to make evidence-based policy or regulatory changes, if necessary.

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