

Contemporary Issues

# Toward a "Post-Legalization" Criminology for Cannabis: A Brief Review and Suggested Agenda for Research Priorities

Contemporary Drug Problems
1-17
© The Author(s) 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/0091450920977976
journals.sagepub.com/home/cdx



Benedikt Fischer<sup>1,2,3,4</sup>, Dimitri Daldegan-Bueno<sup>1</sup>, and Peter Reuter<sup>5</sup>

#### **Abstract**

Cannabis control policies in a few countries have recently shifted from criminal prohibition-based regimes to legalization of use and supply. While cannabis' newly emerging status of legality may suggest a coming "end" for criminology-based interest in the drug, these fundamental changes rather open a window to a new set of criminological research issues and questions, mostly focusing on cannabis use and related behaviors, and their relation to crime and justice. Based on a joint, personal record of several decades of criminological research on cannabis, we briefly review the rationale for five fundamental topics and issues of cannabis-related research associated with legalization. These include: 1) the deterrent effect of prohibition; 2) illicit production, markets and supply in a legalization regime; 3) use enforcement; 4) cannabis-impaired driving; 5) cannabis and crime. This constitutes an-albeit subjectively selective—"post-legalization" research agenda for a cannabis-focused criminology. Other possible areas of research focus or interest within fundamentally different paradigms of criminology (e.g., "critical criminology") are identified and encouraged for development. Overall, the proposed research agenda for a post-legalization cannabis criminology should both contribute discipline-specific knowledge to improved cannabis-related public health and safety as well as allow for important debate and development in this evolving and important research field while entering a new ("postlegalization") era.

## **Keywords**

criminology, crime, cannabis, legalization, policy, research

Received August 12, 2020. Accepted for publication November 3, 2020.

### **Corresponding Author:**

Benedikt Fischer, Faculty of Medical and Health Sciences, University of Auckland, 85 Park Rd, Grafton, Auckland 1023, New Zealand.

Email: b.fischer@auckland.ac.nz

<sup>&</sup>lt;sup>1</sup> Schools of Population Health and Pharmacy, Faculty of Medical and Health Sciences, University of Auckland, New Zealand

<sup>&</sup>lt;sup>2</sup> Department of Psychiatry, University of Toronto, Ontario, Canada

<sup>&</sup>lt;sup>3</sup> Centre for Applied Research in Mental Health & Addiction, Faculty of Health Sciences, Simon Fraser University, Vancouver, British Columbia, Canada

<sup>&</sup>lt;sup>4</sup> Department of Psychiatry, Federal University of Sao Paulo (UNIFESP), Sao Paulo, Brazil

<sup>&</sup>lt;sup>5</sup> School of Public Policy and Department of Criminology, University of Maryland, College Park, MD, USA

## Introduction

In the past decade, many jurisdictions in the Americas, (Canada, multiple US states, and Uruguay) have implemented legalization policies for the non-medical use and supply of cannabis in some form. Other countries (e.g., New Zealand, Luxembourg, Jamaica, Mexico) may soon follow (Decorte et al., 2020; Fischer & Bullen, 2020; Pardo, 2014). Previously, following the formal dictum of the international drug control treaties (e.g., the 1961 Single Convention), signatory countries had been required to criminally prohibit the supply of cannabis; all had complied (Bewley-Taylor et al., 2014; Fischer et al., 2003). Cannabis has long been the world's most widely used illegal drug, with some 200–250 million active users (Degenhardt et al., 2017; UNODC, 2019). Since key voices from the academic domains of criminology had long contributed to, or informed, ideas, concepts and issues around "legalization" (Caulkins et al., 2016; Fischer et al., 2003; Room et al., 2010), one could now view this endeavour as a "mission accomplished" or "file closed," at least for those countries. But rather than assuming criminology's irrelevance for cannabis following legalization, a strong and sustained case can be made for an important and relevant "post-legalization criminology" for cannabis. The variety of forms of implementation legalization has taken in different places heightens this interest. For example, Uruguay's legalization regime is highly restrictive in terms of supply channels and the forms in which the drug can be sold, while Colorado, in contrast, allows for many channels and forms. We, the authors, indeed, believe that there is a useful, while certainly evolved role and perspective for criminology in a "post-legalization" world to investigate essential dynamics or outcomes mainly as relating to new forms of cannabis control/regulation, its use and supply, and possible harms (including crime). On this basis, this paper briefly reviews, and proposes primary foci and questions for a "post-legalization criminology" research agenda for cannabis, primarily for general discussion and debate and further development. Toward this, we offer two general observations at the outset. First, we acknowledge criminology as a multi-perspectival field that combines different disciplines (e.g., law, sociology, psychology, economics, others); on this basis, criminology is both a heterogeneously while variably defined and practiced area of science. Second, our observations mostly root in material law-based or functionalist perspective on cannabis- (and mostly use-) related behaviors or issues of crime and their control. This is in contrast to multiple other possible, fundamental frameworks or ontologies for criminology, and consequential issues or phenomena related to cannabis and crime (some of which we briefly acknowledge and encourage for further development below). On this basis, our observations are both individually subjective as well as selectively focused, while legitimately expanded or complemented by other criminology-based perspectives or priorities.

# General Use Deterrence

A longstanding controversy concerns whether the criminalization of cannabis has resulted in lowered prevalence of cannabis use (Boyum & Kleiman, 2001; Caulkins et al., 2016; MacCoun & Reuter, 2001; Weatherburn & Jones, 2001). While cannabis use has long been common (with many youth cohorts in Australia, Canada and the United States showing lifetime prevalence around 50%), levels also varied considerably across time and place in Western jurisdictions (Compton et al., 2004; Degenhardt et al., 2013; Kokkevi et al., 2006; Room et al., 2010). No research has offered a convincing account for that variation, even though this represents an unusually good opportunity for comparative study of different drug policy regimes, for example prohibition, decriminalization or legalization, and their effect on primary outcomes (e.g., use) because marijuana use is better measured than the use of any other prohibited drug. Such studies should also allow for identification of the mechanisms by which policy exerts an influence. Multiple mechanisms might account for lower prevalence of cannabis use in a prohibition regime as compared to legalized availability. For example, (a) prohibition and its enforcement should lead to higher cannabis prices and thus lower use. It is indeed striking that the

price of cannabis in the Netherlands, with effectively legal retail, is approximately as high as in neighboring countries because of relatively tough enforcement against production and trafficking, which remain illegal (MacCoun, 2011); (b) the threat of arrest for use might have a distinct deterrent effect working on the demand (i.e., user) side; (c) prohibition prevents commercial promotion of the product and inhibits research and development. Each mechanism requires a separate line of empirical analysis.

The hypothesis that cannabis' criminal status served to deter sizable numbers of people from use is commonly refuted by reference to inconsistent cross-jurisdictional cannabis use patterns. In fact, use levels are higher in select jurisdictions with apparently severe punitive control (e.g., the US), as compared to others with more liberal approaches (e.g., the Netherlands) (Barratt et al., 2005; MacCoun et al., 2009; Reinarman et al., 2004; Simons-Morton et al., 2010). However, no study has included any objective measure of enforcement intensity, which minimally needs to be separated into supply side and demand side enforcement. Whether the United States' enforcement is actually intense (e.g. as measured by probability of sanction conditional on use) compared to other countries is not known.

Legalization, now, offers a major "natural experiment" which permits examination of the effect of prohibition itself. The comparison of the two regimes is complicated by differences in implementation, such as differential use and product regulations, or prices and tax rates in legalized jurisdictions and variations in enforcement and penalties in jurisdiction that retain prohibition. For example, prices for recreational cannabis in the various US "legalization" states vary considerably, perhaps reflecting policy regime differences or just the time required for the implementation of a legalization regime (Hunt & Pacula, 2017). Nonetheless, legalization jurisdictions can be systematically compared to prohibitory jurisdictions with respect to trajectories or patterns of cannabis use (e.g. intensity); deterrence dynamics can be compared on both individual and population levels. Findings that may support the assumption of criminalization's general deterrent effect include that use levels—at least in some sub-groups—have somewhat increased, and substantial proportions of non-users have declared their intent to use cannabis under legalization conditions (Carliner et al., 2017; Cerdá et al., 2020; Melchior et al., 2019; Rusby et al., 2018). The US National Survey on Drug Use and Health, for example, has a large enough multi-state sample to allow such comparisons in models of individual use patterns (NSDUH, 2020). The principal research questions include the possibly changing effects and dynamics of "deterrence" in the context of legalization on actual cannabis use, as well as use intent for or attitudes toward use under changing legal control frameworks.

# Illicit Production, Markets and Supply

Major goals of legalization include reducing the involvement of criminal justice in cannabis users' lives and depriving criminal organizations of revenues. Thus, comprehensive cannabis legalization comprises provisions for both legal use and legal supply, aiming to shift consumers from illegal to legal sources. Legal sources can involve one or more of a variety of arrangements: retail sale distribution (e.g., physical stores and/or mail order), regulated "cannabis clubs" or other low-level production collectives and "home growing" for users (Caulkins et al., 2015; Decorte et al., 2017, 2020; Fischer, 2017).

However in "legalization" jurisdictions an extensive illegal sector has remained, even with a substantial amount of purchases from legal cannabis sources (Caulkins et al., 2018; Fischer, Lee, O'Keefe-Markman, & Hall, 2020; Smart et al., 2017; Wadsworth et al., 2019). For example, about half of users in Canada used some legal sources 1-year post-legalization, yet only about one-in-three exclusively relied on legal sources for their supply. In Uruguay, two-thirds of frequent users reported illegal sourcing of their cannabis (Boidi et al., 2016; Queirolo, 2020). In addition, "gray" (technically non-legal) sources, often related to personal networks or "medical cannabis" provisions, continue to be

utilized by many (Amlung & MacKillop, 2019; Boidi et al., 2016; Davenport & Caulkins, 2016; Hunt & Pacula, 2017; Sen & Wyonch, 2018; Wadsworth et al., 2019).

This partial failure in the transition to legal cannabis sources for personal supply may reflect a number of factors including: restricted availability and access (e.g. limited locations, opening hours) of legal sources (Fischer, 2017; Kilmer & Pacula, 2017; Lancione et al., 2020; Pardal et al., 2019; Reed et al., 2020) and age restrictions (21 in all US, mostly 19 in Canadian jurisdictions), higher prices in the legal sector and restrictions on the products legally available. Uruguay in particular has tight restrictions both on the potency of legally retailed cannabis and on the modes of access (Queirolo, 2020); for example users must register to use only one of the three modes of access (home grow; joining a growers club or purchasing from a pharmacy). Other likely factors relate to price and supply (e.g., the available product menu). In North American legalization settings, illegal cannabis markets supply (e.g., high-potency) product not readily offered by legal sources. Despite the substantial decreases in the prices for legal product, as much as 50% in three years, it appears that illegal suppliers are selling at still lower prices (Caulkins et al., 2018; Smart et al., 2017; Wadsworth et al., 2019). Prices of illegal cannabis in Canada recently were reported to be about half of those for legal products (\$6/gram vs. \$10/gram) (Fischer, Lee, O'Keefe-Markman, & Hall, 2020).

The research questions here are quite broad: How does the share of cannabis purchases in the legal market vary with the parameters (e.g., access restrictions) of the legal regime? Can users who frequent legal versus illegal markets be distinctly characterized? What role do price and related costs (e.g., taxation) dynamics play for continued illegal market activities? Do illegal cannabis markets specialize in distinct cannabis products (e.g., those unavailable from legal sources) and to which extent is there diversion from legal production or sources to illegal distribution? Additional questions may relate to the possible adaptation of illegal market structures or resources in new legalization context, for example: Do previously illegal producers switch to or join ("cross-over") "legal" cannabis production or supply activities, or remain in illegal supply environments? How do illegal cannabis market segments evolve or adapt in their business orientation or related behaviors and strategies (re: products or audiences)?

# Use Enforcement

Most criminal control regimes for cannabis had long been characterized by erratic and arbitrary enforcement (Boyd, 2013; Fischer et al., 2003; Johnson et al., 1977; MacCoun et al., 2009; Nguyen & Reuter, 2012; Turnbull, 2009). The probability of arrest, conditional on recent use, was estimated at only about 2%–4% across several countries around 2005, and has further decreased in many (Room et al., 2010). Cannabis enforcement reliably reached only small proportions of users. It typically targeted select sub-groups, mostly involving young males from marginalized or racialized (e.g., black, other ethnic) backgrounds (Fergusson et al., 2003; Geller & Fagan, 2010; Golub et al., 2007; Lynch et al., 2013; Provine, 2011; Tonry & Melewski, 2008; Wortley & Owusu-Bempah, 2011). Hence, the realities of cannabis enforcement were commonly biased and discriminatory. In addition, the "collateral harms" of cannabis user criminalization, for example arrest or criminal records for convictions and their deleterious effects on personal or professional life prospects, were recognized as its primary excesses informing calls for its reform (Crepault et al., 2016; Lenton et al., 2000; Room et al., 2010; Shanahan & Ritter, 2014; Single et al., 2000; Warburton et al., 2004).

However, reform towards legalization has not completely eliminated user criminalization. As noted, under legalization cannabis use is restricted to individuals above a certain age, ranging between 18 and 21 years across most jurisdictions (Ammerman et al., 2015; Decorte et al., 2020; Pardo, 2014). This excludes sizable sub-groups of youth whose cannabis use rates (e.g., 25%–30% in past year) are among the highest (Degenhardt et al., 2016; Hall & Degenhardt, 2007; Wadsworth & Hammond, 2019). While initiatives for legalization policy have stressed improved protections of young people as

a key "vulnerable" population, simple cannabis possession of small amounts, e.g. for personal use, in Canada, for example, are subject to possible charges under the *Youth Criminal Justice Act* (Fischer, Bullen, Elder, & Fidalgo, 2020). In addition, legalization frameworks have established several new offenses concerning cannabis possession- and use-related restrictions, and related quantity limits or social sharing, depending on the jurisdiction (Caulkins & Kilborn, 2019; Decorte et al., 2020; Johnson et al., 2018; Lancione et al., 2020; Smart & Kleiman, 2019; Watson & Erickson, 2019). For example, both Canada's 2018 "Cannabis Act" as the legal basis for legalization and New Zealand's proposed "Cannabis Legalisation and Regulation Bill" provide for punitive (some criminal) sanctions and enforcement for those in possession of cannabis above defined personal limits and those sharing with minors/under-age individuals and under-age use (Fischer, Bullen, Elder, & Fidalgo, 2020; Fischer & Daldegan-Bueno, 2020; Government of Canada, 2019). These have been among the principal offenses leading to cannabis arrests immediately following the implementation of legalization in Canada (Statistics Canada, 2019).

While initial (mainly US-based) data indicate that enforcement activities against adult users have markedly decreased in both legalization and decriminalization settings, arrest rates for under-age users or youth have not dropped nearly as much. In fact, some increases in enforcement against youth users have occurred in "legalization" states in the US (Firth et al., 2019, 2020; Grucza et al., 2018; Plunk et al., 2019; Wiens et al., 2018). In addition, racialized or socio-economically skewed cannabis-related arrest patterns appear to persist in legalization systems (Firth et al., 2020). A related, "social justice"-focused issue has been the purging or expungement of criminal records for those convicted for personal cannabis use offenses under past prohibition regimes. While there is no universal consensus on whether such efforts are justified or appropriate, or what best approaches are, such efforts have been selectively initiated in Canada and the US. However, whether this has led to improved and sustained "social justice" either at the individual or population level is unclear to date (Adinoff & Reiman, 2019; Ahrens, 2020; McAleese, 2019).

Hence, systematic examination of the evolving activities and outcomes of cannabis-use related enforcement are required, including the following questions: what groups or activities does cannabis-related enforcement focus on under legalization? What, specifically, are the patterns of enforcement for non-legal users, and new offenses? Do systematically arbitrary/selective enforcement patterns continue in legalization environments? What are the different approaches and experiences with "social justice" oriented efforts of criminal records expungement for previously convicted cannabis use offenders?

# Cannabis-Impaired Driving

Cannabis-impaired driving—next to cannabis use disorders (e.g., dependence)—is a primary contributor to cannabis-related health burden and harms (Hall, 2015; Imtiaz et al., 2016; Volkow et al., 2014). As is well-documented, acute (e.g., cognitive, reaction, psycho-motor control) impairment from cannabis use reduces critical driving skills and is associated with a moderate (e.g., about 2-fold) increase in the odds for—fatal or non-fatal—motor-vehicle-crash involvement (Asbridge et al., 2012; Li et al., 2011; Rogeberg & Elvik, 2016). As such, cannabis-impaired driving constitutes a unique cause of cannabis-attributable mortality (Calabria et al., 2010; Degenhardt et al., 2017). Cannabis-impaired driving is common. In North America, 5%—10% of drivers, and one-in-three or more of cannabis users—disproportionately young adults—report cannabis-impaired driving (Compton, 2017; Johnson et al., 2012; Patel & Amlung, 2019; Wadsworth & Hammond, 2019). In a roadside survey in Washington state, the proportion of THC-positive drivers almost tripled, from 8% before legal cannabis sales to 23% 6 months after (Eichelberger, 2019). In addition, a substantial proportion of cannabis-impaired drivers drive following the co-use of alcohol, which further increases impairment and thus the risks of crash-involvement (Bramness et al., 2010; Hall, 2017; Zhu & Wu, 2016).

Cannabis users who drive do so for multiple reasons, including a belief that cannabis does not impair driving ability and/or lack of fear of detection or apprehension (Earle et al., 2019; McCarthy et al., 2007; Watson et al., 2019).

Unquestionably, controlling cannabis-impaired driving, and its imminent physical harm for users and others, is a crucial requirement toward improving cannabis-related public health and safety under legalization (Calabria et al., 2010; Fischer et al., 2018). Multiple recent studies involving different designs, however, point to slight increases in cannabis-related traffic fatalities following the implementation of legalization, likely reflecting increased prevalence and social acceptability of cannabis use (Aydelotte et al., 2019; Steinemann et al., 2018). These developments require more effective intervention strategies for cannabis-impaired driving. These may well draw on important lessons from alcohol-impaired driving enforcement strategies. Over the past decades, the prevalence of alcoholimpaired driving, and specifically related crashes/fatalities, have consistently decreased in North America (Fell et al., 2016; Naimi et al., 2018; Teutsch et al., 2018; Yao et al., 2016). This decrease has been mainly attributed to optimized "deterrence"-based enforcement approaches (e.g., more severe penalties, improved detection or apprehension strategies, swifter consequences) combined with systematic negative social norming of "drinking-and-driving" (Babor et al., 2010; Elder et al., 2004; Hyder, 2018; Kilmer & Midgette, 2020). Effective "roadside" testing methods for cannabis impairment remain subject to controversy, since they continue to struggle with imprecision due to the pharmacological nature of cannabinoids i.e. uncertainty about the relationship between measured THC and active host impairment (Dobri et al., 2019; Ginsburg, 2019). The fundamentals of and different options for effective intervention strategies for targeting cannabis-impaired driving have not yet been developed (e.g., better social or educational strategies) or are lagging in implementation (e.g., widespread roadside-based testing). These require major improvements toward supporting the declared public health and safety objectives of legalization (Jones et al., 2006; Pacula et al., 2014; Watling et al., 2014; Wong et al., 2014).

Key research questions include: What enforcement approaches establish more effective "deterrence" of cannabis impaired driving, and how will cannabis-impaired driving and related accidents evolve in legalization environments? What are the key design elements and operational provisions for these systems? Will individual attitudes, and social norming toward cannabis-impaired driving change, as has occurred when drinking-and-driving became increasingly socially shunned behavior and "designated drivers" became socially desirable roles in many socio-cultural settings? To what extent may cannabis-impaired driving be related to inconsistent, or inter-jurisdictionally different (e.g., legal versus illegal) cannabis supply or availability structures?

## Cannabis and Crime

There has been a longstanding research interest in the relationship between cannabis and non-drug (i.e., interpersonal or property) crime (Abel, 1977; Himmelstein, 1983; Macleod et al., 2004; Pacula & Kilmer, 2003). Given the nature of its psycho-pharmacological effects on users, cannabis is generally less likely to lead to most types of crime since it reduces, rather than instills aggression, thus not generating the inter-personal violence commonly associated with alcohol or psycho-stimulants (e.g., cocaine) (Boles & Miotto, 2003; Chermack & Giancola, 1997; Homer et al., 2008; Moore & Stuart, 2005). Nor is a cannabis habit so expensive to generate economic compulsive crime. Yet a variety of trajectory frameworks for cannabis-related crime have been proposed; related evidence is inconsistent, with some suggesting possible (moderate) positive associations between cannabis use and crime following different pathways (Hoaken & Stewart, 2003; Moore & Stuart, 2005; Ostrowsky, 2011; Pedersen & Skardhamar, 2010). Some of these directly relate to the illegal status or contexts of cannabis itself, while others relate to acquisition or particular social networks associated with

cannabis. Select cannabis-associated crime or victimization risks—for example, as related to interpersonal aggression—may be particularly common among youth/adolescents (Maniglio, 2015).

Since the protection of public health and safety are primary objectives of cannabis legalization, a better understanding of—both individual and population-level—associations between cannabis and crime is needed. Crime and violence, whatever their cause, impose high economic costs and crime control is resource-intensive; those costs account for a substantial share of all estimates of the social costs of drug use. Alcohol clearly demonstrates this proposition; crime and crime control costs are an important part of the social costs of alcohol. This has major implications for policy development (Babor et al., 2018; Boyum & Kleiman, 2001; Fischer et al., 2009; Miller et al., 2006; Stevens, 2011). One major variable here is how legal cannabis availability and use may impact on alcohol use in the population (e.g., through possible "substitution" effects) which is strongly associated with different types of crime. Even just a small, partial replacement of alcohol use (particularly intensive drinking by young males) by cannabis may correspondingly lower associated crime burdens (Guttmannova et al., 2016; McClelland & Teplin, 2001; Subbaraman, 2016; Toomey et al., 2012). On the other hand, if cannabis and alcohol are complementary substances, so that youthful cannabis use increases heavy alcohol use, the public health gains from other consequences of cannabis legalization may be lost.

Early assessments of the impacts of cannabis legalization on (mostly US-based) population-level crime found that it is either not associated with differences, or rather associated with slight decreases in the incidence of specific types of (e.g., property, violent) crimes, when compared to non-legalization states. Thus, current evidence does not point to criminogenic effects attributable to liberalization policies (Brinkman & Mok-Lamme, 2019; Dragone et al., 2019; Lu et al., 2019; Maier et al., 2017; Morris et al., 2014; Shepard & Blackley, 2016). These outcomes are important towards public health-and safety-related considerations for different cannabis control options, and so warrant further thorough examination.

Key research questions include: Are there associations between cannabis use and crime specifically in the context of legalization, and what are these? Are there observable impacts on key types of population-level (e.g., property or violence) crimes associated with legalization? To which extent are there observable geo-spatial or -temporal patterns (e.g., related to retail outlet density, consumption spaces or weekend activities) in cannabis-related crime, for example as have been observed for alcohol? Does the removal of cannabis from illegal contexts impact other criminogenic behavior or outcomes, and what do these dynamics look like for (e.g., underage/youth) users who still do not have legal access?

## Discussion

The long-standing prohibition of cannabis both for users and producers/sellers now finds itself increasingly challenged, and subject to law or policy reforms in many countries. In two national and multiple sub-national jurisdictions, the state has created legal regimes of supply and use of cannabis for pleasure ("legalization"), responding to claims of individual rights as well as public health and safety objectives. While legalization reform appears to remove cannabis and its use as a categorical object of crime for criminological study, this by no means implies the end of interest or relevance for criminological study in the post-legalization age. There are still criminogenic dynamics or outcomes, and most psychoactive substances present direct or indirect associations with crime (Bennett et al., 2008; MacCoun et al., 2003; Seddon, 2000). Above, we have briefly reviewed, and proposed some key—while select—themes and issues that appear to be a priority for criminological study or investigation in the "post-legalization" age and within legalization frameworks; this list surely is subjective, and others may, naturally, see or propose other ones.

We will make two general, additional points related to the substantive issues laid out. First, a substantial portion of advocacy for cannabis legalization reform has been conveyed involving

categorical (and often righteous) claims that prohibition has been a "failure" as a policy, and therefore urgently needed replacement. While prohibition may not have worked well as a policy in many ways, and definitely generated many unintended negative consequences, select aspects may have provided distinct, desirable policy outcomes, including possible general deterrence at least in some sub-groups leading to lower consumption of a product not without risk for adverse consequences to the user (Hall et al., 2019; Smart & Pacula, 2019). Current legalization experiments will permit examination of these possible effects. The simultaneous existence of legal and illegal cannabis markets (including key elements of production, distribution, price) within legalization frameworks provide a unique opportunity and target for study which does not exist for many other consumption commodities. The study, naturally, is complicated by the interaction of the two sectors, the heterogeneity of both legal and prohibition regimes, and the long time required for new norms of use to develop in the legalized market. Furthermore, it is easily overlooked that legalization provides for legal use of and access to cannabis for \*some\*, i.e. legal-age/adult users, but retains these as illegal for the sub-population of adolescents/youth where demand is highest (Fischer, Bullen, Elder, & Fidalgo, 2020). This is not only a unique constellation in comparison with other risky consumption behaviors, but maintains young people as a main enforcement target, including the questionable (e.g., arbitrary, racialized, etc. enforcement) dynamics this has entailed under prohibition. Also, since legalization reforms prominently emphasized goals of improved protection of young people's health and safety as a "vulnerable population," it will be critically important for criminological investigation to assess whether these goals are actually met.

Beyond that, and explicitly acknowledging comments of (anonymous) peer-reviewers of our present paper, we reiterate that our proposed points and questions for a post-legalization cannabis criminology are both subjective and selective. They are framed by a mainly law-based approach specifically to cannabis-related behaviors and crime as well as (inevitably) influenced by our (as authors') own research interests in this field. There are ample additional, fundamental and important criminology-related research issues and questions related to cannabis—some set in essentially different theoretical paradigms (e.g., "critical criminology") (Chambliss, 2003; Miller & Carbone-Lopez, 2015; Young, 2002). For example, critical criminological research may continue to be interested in the differential framings of, or socio-economic dynamics behind cannabis use-related harms (e.g., underage use or illegal supply) as crimes in post-legalization contexts, as compared with harms arising from (traditionally legal) substances of alcohol or tobacco. This would include consideration of select convergences in the socio-legal status across substances, with tobacco use becoming increasingly more restricted, marginalized and penalized (Fischer, Bullen, & Hall, 2020; Smith et al., 2017; Studlar, 2006). Other foci may be on aspects of "corporate crime," which may, for example, examine whether emerging legal cannabis industries will engage in similar misleading, or outwardly illegal corporate efforts and strategies toward expanding markets and sales (especially toward vulnerable, young people) as have been demonstrated for other "pleasure product," pharmaceutical or substance industries (Barry et al., 2014; Griffin & Miller, 2011; Passas, 2005). Similarly, related criminological research inquiries, e.g. as related to use, crime and alternative control regime options, may be extended to currently criminalized, other illegal substances (e.g., illicit opioids or psych-stimulants) (Greer & Ritter, 2020; Hall, 2018; Taylor et al., 2016). While these are just further illustrative examples for mention, numerous other research issues and questions may be legitimately included in an emerging post-legalization research agenda for cannabis, depending on perspective and priorities.

Thus, while the categorical "criminalization" of cannabis use and supply may be coming to its end in multiple places, a new chapter and agenda of "post-legalization" criminology for cannabis is just set and ready to be emerging. We have selectively proposed and briefly elaborated on some key research issues, priorities and foci for such a research agenda, an effort which we trust to be useful for active public debate, discussion and further development.

# **Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## **Funding**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Dr. Fischer acknowledges research support from the endowed Hugh Green Foundation Chair in Addiction Research, Faculty of Medical and Health Sciences, University of Auckland; he furthermore reports grants and contract funding support for topics related to the present article from public-only (e.g., public funding, government agencies) sources.

#### **ORCID iD**

Benedikt Fischer https://orcid.org/0000-0002-2186-4030

## References

- Abel, E. L. (1977). The relationship between cannabis and violence: A review. *Psychological Bulletin*, 84(2), 193–211. https://doi.org/10.1037/0033-2909.84.2.193
- Adinoff, B., & Reiman, A. (2019). Implementing social justice in the transition from illicit to legal cannabis. *The American Journal of Drug and Alcohol Abuse*, 45(6), 673–688. https://doi.org/10.1080/00952990.2019. 1674862
- Ahrens, D. M. (2020). Retroactive legality: Marijuana convictions and restorative justice in an era of criminal justice reform. *Journal of Criminal Law and Criminology*, 110(3), 379–440.
- Amlung, M., & MacKillop, J. (2019). Availability of legalized cannabis reduces demand for illegal cannabis among Canadian cannabis users: Evidence from a behavioural economic substitution paradigm. *Canadian Journal of Public Health*, 110(2), 216–221. https://doi.org/10.17269/s41997-018-0160-4
- Ammerman, S., Ryan, S., & Adelman, W. P. (2015). The impact of marijuana policies on youth: Clinical, research, and legal update. *Pediatrics*, 135(3), e769–e785. https://doi.org/10.1542/peds.2014-4147
- Asbridge, M., Hayden, J. A., & Cartwright, J. L. (2012). Acute cannabis consumption and motor vehicle collision risk: Systematic review of observational studies and meta-analysis. *BMJ*, *344*, e536. https://doi.org/10.1136/bmj.e536
- Aydelotte, J. D., Mardock, A. L., Mancheski, C. A., Quamar, S. M., Teixeira, P. G., Brown, C. V. R., & Brown, L.
   H. (2019). Fatal crashes in the 5 years after recreational marijuana legalization in Colorado and Washington.
   Accident Analysis & Prevention, 132, 105284. https://doi.org/10.1016/j.aap.2019.105284
- Babor, T. F., Babor, T., Caetano, R., Casswell, S., Edwards, G., Giesbrecht, N., Grube, J. W., & Graham, K. (2010). Alcohol: No ordinary commodity—Research and public policy. Oxford Scholarship Online. 9780199551149.
- Babor, T. F., Caulkins, J. P., Edwards, G., Fischer, B., Foxcroft, D. R., Humphreys, K., Obot, I. S., Rehm, J., & Reuter, P. (2018). *Drug policy and the public good* (2nd ed.). Oxford University Press.
- Barratt, M. J., Chanteloup, F., Lenton, S., & Marsh, A. (2005). Cannabis law reform in Western Australia: An opportunity to test theories of marginal deterrence and legitimacy. *Drug and Alcohol Review*, 24(4), 321–330. https://doi.org/10.1080/09595230500263863
- Barry, R. A., Hiilamo, H., & Glantz, S. A. (2014). Waiting for the opportune moment: The tobacco industry and marijuana legalization. *The Milbank Quarterly*, 92(2), 207–242. https://doi.org/10.1111/1468-0009.12055
- Bennett, T., Holloway, K., & Farrington, D. (2008). The statistical association between drug misuse and crime: A meta-analysis. *Aggression and Violent Behavior*, 13(2), 107–118. https://doi.org/10.1016/j.avb.2008.02.001
- Bewley-Taylor, D., Blickman, T., & Jelsma, M. (2014). The rise and decline of cannabis prohibition—The history of cannabis in the UN drug control system and options for reform. Global Drug Policy Observatory.

- Boidi, M. F., Queirolo, R., & Cruz, J. M. (2016). Cannabis consumption patterns among frequent consumers in Uruguay. *International Journal of Drug Policy*, 34, 34–40. https://doi.org/10.1016/j.drugpo.2016.05.008
- Boles, S. M., & Miotto, K. (2003). Substance abuse and violence: A review of the literature. *Aggression and Violent Behavior*, 8(2), 155–174. https://doi.org/10.1016/S1359-1789(01)00057-X
- Boyd, N. (2013). The enforcement of marijuana possession offences in British Columbia: A blueprint for change: Research, Writing, and Consultations on Crime, Law and Justice. https://www.neilboyd.net/articles/Blueprint%20for%20Change.pdf
- Boyum, D., & Kleiman, M. (2001). Substance abuse policy from a crime-control perspective. In J. Q. Wilson & J. Petersilia (Eds.), *Crime: Public policies for crime control* (pp. 331–382). Institute for Contemporary Studies.
- Bramness, J. G., Khiabani, H. Z., & Mørland, J. (2010). Impairment due to cannabis and ethanol: Clinical signs and additive effects. *Addiction*, 105(6), 1080–1087. https://doi.org/10.1111/j.1360-0443.2010.02911.x
- Brinkman, J., & Mok-Lamme, D. (2019). Not in my backyard? Not so fast. The effect of marijuana legalization on neighborhood crime. *Regional Science and Urban Economics*, 78, 103460. https://doi.org/10.1016/j.regsciur beco.2019.103460
- Calabria, B., Degenhardt, L., Hall, W., & Lynskey, M. (2010). Does cannabis use increase the risk of death? Systematic review of epidemiological evidence on adverse effects of cannabis use. *Drug and Alcohol Review*, 29(3), 318–330. https://doi.org/10.1111/j.1465-3362.2009.00149.x
- Carliner, H., Brown, Q. L., Sarvet, A. L., & Hasin, D. S. (2017). Cannabis use, attitudes, and legal status in the U. S.: A review. *Preventive Medicine*, 104, 13–23. https://doi.org/10.1016/j.ypmed.2017.07.008
- Caulkins, J. P., Bao, Y., Davenport, S., Fahli, I., Guo, Y., Kinnard, K., Najewicz, M., Renaud, L., & Kilmer, B. (2018). Big data on a big new market: Insights from Washington State's legal cannabis market. *International Journal of Drug Policy*, *57*, 86–94. https://doi.org/10.1016/j.drugpo.2018.03.031
- Caulkins, J. P., & Kilborn, M. L. (2019). Cannabis legalization, regulation, & control: A review of key challenges for local, state, and provincial officials. *The American Journal of Drug and Alcohol Abuse*, 45(6), 689–697. https://doi.org/10.1080/00952990.2019.1611840
- Caulkins, J. P., Kilmer, B., & Kleiman, M. A. R. (2016). *Marijuana legalization: What everyone needs to know*<sup>®</sup> (2nd ed.). Oxford University Press.
- Caulkins, J. P., Kilmer, B., Kleiman, M. A. R., MacCoun, R. J., Midgette, G., Oglesby, P., Pacula, R. L., & Reuter,
   P. H. (2015). Considering marijuana legalization: Insights for Vermont and other jurisdictions. RAND Corporation.
- Cerdá, M., Mauro, C., Hamilton, A., Levy, N. S., Santaella-Tenorio, J., Hasin, D., Wall, M. M., Keyes, K. M., & Martins, S. S. (2020). Association between recreational marijuana legalization in the United States and changes in marijuana use and cannabis use disorder from 2008 to 2016. *JAMA Psychiatry*, 77(2), 165–171. https://doi.org/10.1001/jamapsychiatry.2019.3254
- Chambliss, W. J. (2003). Drug war politics: Racism, corruption and alienation. In D. F. Hawkins, S. L. Myers, & R. N. Stone (Eds.), Crime control and social justice: The delicate balance (pp. 296–316). Greenwood Press.
- Chermack, S. T., & Giancola, P. R. (1997). The relation between alcohol and aggression: An integrated biopsychosocial conceptualization. *Clinical Psychology Review*, 17(6), 621–649. https://doi.org/10.1016/S0272-73 58(97)00038-X
- Compton, R. P. (2017). *Marijuana-impaired driving—A report to congress*. United States Department of Transportation—National Transportation Library. https://rosap.ntl.bts.gov/view/dot/34995
- Compton, W. M., Grant, B. F., Colliver, J. D., Glantz, M. D., & Stinson, F. S. (2004). Prevalence of marijuana use disorders in the United States: 1991-1992 and 2001-2002. *JAMA*, 291(17), 2114–2121. https://doi.org/10.1001/jama.291.17.2114
- Crepault, J. F., Rehm, J., & Fischer, B. (2016). The cannabis policy framework by the Centre for Addiction and Mental Health: A proposal for a public health approach to cannabis policy in Canada. *The International Journal on Drug Policy*, 34, 1–4. https://doi.org/10.1016/j.drugpo.2016.04.013
- Davenport, S., & Caulkins, J. (2016). Evolution of the United States marijuana market in the decade of liberalization before full legalization. *Journal of Drug Issues*, 46. https://doi.org/10.1177/0022042616659759

Decorte, T., Lenton, S., & Wilkins, C. (2020). *Legalizing cannabis: Experiences, lessons and scenarios*. Taylor & Francis Group. Routledge.

- Decorte, T., Pardal, M., Queirolo, R., Boidi, M. F., Sánchez Avilés, C., & Parés Franquero, Ò. (2017). Regulating cannabis social clubs: A comparative analysis of legal and self-regulatory practices in Spain, Belgium and Uruguay. *International Journal of Drug Policy*, 43, 44–56. https://doi.org/10.1016/j.drugpo.2016.12.020
- Degenhardt, L., Ferrari, A. J., Calabria, B., Hall, W. D., Norman, R. E., McGrath, J., Flaxman, A. D., Engell, R. E., Freedman, G. D., Whiteford, H. A., & Vos, T. (2013). The global epidemiology and contribution of cannabis use and dependence to the global burden of disease: Results from the GBD 2010 study. *PLoS One*, 8(10), e76635. https://doi.org/10.1371/journal.pone.0076635
- Degenhardt, L., Ferrari, A. J., & Hall, W. D. (2017). Chapter 10—The global epidemiology and disease burden of cannabis use and dependence. In V. R. Preedy (Ed.), *Handbook of cannabis and related pathologies* (pp. 89–100). Academic Press.
- Degenhardt, L., Stockings, E., Patton, G., Hall, W. D., & Lynskey, M. (2016). The increasing global health priority of substance use in young people. *The Lancet Psychiatry*, *3*(3), 251–264. https://doi.org/10.1016/S2215-0366(15)00508-8
- Dobri, S. C. D., Moslehi, A. H., & Davies, T. C. (2019). Are oral fluid testing devices effective for the roadside detection of recent cannabis use? A systematic review. *Public Health*, 171, 57–65. https://doi.org/10.1016/j. puhe.2019.03.006
- Dragone, D., Prarolo, G., Vanin, P., & Zanella, G. (2019). Crime and the legalization of recreational marijuana. *Journal of Economic Behavior & Organization*, 159, 488–501. https://doi.org/10.1016/j.jebo.2018.02.005
- Earle, A. M., Napper, L. E., LaBrie, J. W., Brooks-Russell, A., Smith, D. J., & de Rutte, J. (2019). Examining interactions within the theory of planned behavior in the prediction of intentions to engage in cannabis-related driving behaviors. *Journal of American College Health*, 1–7. https://doi.org/10.1080/07448481.2018.1557197
- Eichelberger, A. H. (2019). Marijuana use and driving in Washington State: Risk perceptions and behaviors before and after implementation of retail sales. *Traffic Injury Prevention*, 20(1), 23–29. https://doi.org/10.1080/153 89588.2018.1530769
- Elder, R. W., Shults, R. A., Sleet, D. A., Nichols, J. L., Thompson, R. S., & Rajab, W., & Task Force on Community Preventive, S. (2004). Effectiveness of mass media campaigns for reducing drinking and driving and alcohol-involved crashes: A systematic review. *American Journal of Preventive Medicine*, 27(1), 57–65. https://doi.org/10.1016/j.amepre.2004.03.002
- Fell, J. C., Beirness, D. J., Voas, R. B., Smith, G. S., Jonah, B., Maxwell, J. C., Price, J., & Hedlund, J. (2016). Can progress in reducing alcohol-impaired driving fatalities be resumed? Results of a workshop sponsored by the transportation research board, alcohol, other drugs, and transportation committee (ANB50). *Traffic Injury Prevention*, 17(8), 771–781. https://doi.org/10.1080/15389588.2016.1157592
- Fergusson, D. M., Swain-Campbell, N. R., & Horwood, L. J. (2003). Arrests and convictions for cannabis related offences in a New Zealand birth cohort. *Drug and Alcohol Dependence*, 70(1), 53–63. https://doi.org/10.1016/S0376-8716(02)00336-8
- Firth, C. L., Hajat, A., Dilley, J. A., Braun, M., & Maher, J. E. (2020). Implications of cannabis legalization on juvenile justice outcomes and racial disparities. *American Journal of Preventive Medicine*. https://doi.org/10. 1016/j.amepre.2019.11.019
- Firth, C. L., Maher, J. E., Dilley, J. A., Darnell, A., & Lovrich, N. P. (2019). Did marijuana legalization in Washington State reduce racial disparities in adult marijuana arrests? *Substance Use & Misuse*, 54(9), 1582–1587. https://doi.org/10.1080/10826084.2019.1593007
- Fischer, B. (2017). Legalisation of non-medical cannabis in Canada: Will supply regulations effectively serve public health? *The Lancet Public Health*, 2(12), e536–e537. https://doi.org/10.1016/S2468-2667(17)30213-X
- Fischer, B., Ala-Leppilampi, K., Single, E., & Robins, A. (2003). Cannabis law reform in Canada: Is the "saga of promise, hesitation and retreat" coming to an end?1. Canadian Journal of Criminology and Criminal Justice, 45, 265–298. https://doi.org/10.3138/cjccj.45.3.265

- Fischer, B., & Bullen, C. (2020). Emerging prospects for non-medical cannabis legalisation in New Zealand: An initial view and contextualization. *International Journal of Drug Policy*, 76, 102632. https://doi.org/10.1016/j. drugpo.2019.102632
- Fischer, B., Bullen, C., Elder, H., & Fidalgo, T. M. (2020). Considering the health and social welfare impacts of non-medical cannabis legalization. *World Psychiatry*, 19(2), 187–188. https://doi.org/10.1002/wps.20736
- Fischer, B., Bullen, C., & Hall, W. (2020). A call for greater policy and regulatory coherence for an expanding menu of legal psychoactive substances. *Drug and Alcohol Review*. https://doi.org/10.1111/dar.13071
- Fischer, B., & Daldegan-Bueno, D. (2020). New Zealand's 'Cannabis Legalisation and Regulation Bill': An evidence-based assessment and critique of essential regulatory components towards policy outcomes. *New Zealand medical journal*, 133(1519), 103–111.
- Fischer, B., Lee, A., O'Keefe-Markman, C., & Hall, W. (2020). Initial indicators of the public health impacts of non-medical cannabis legalization in Canada. *EClinicalMedicine*, 20, 100294. https://doi.org/10.1016/j.eclinm.2020.100294
- Fischer, B., Rehm, J., & Hall, W. (2009). Cannabis use in Canada: The need for a 'public health' approach. Canadian Journal of Public Health, 100(2), 101–103. https://doi.org/10.1007/BF03405515
- Fischer, B., Russell, C., Rehm, J., & Leece, P. (2018). Assessing the public health impact of cannabis legalization in Canada: Core outcome indicators towards an 'index' for monitoring and evaluation. *Journal of Public Health*, 41(2), 412–421. https://doi.org/10.1093/pubmed/fdy090
- Geller, A., & Fagan, J. (2010). Pot as pretext: Marijuana, race, and the new disorder in New York city street policing. *Journal of Empirical Legal Studies*, 7(4), 591–633. https://doi.org/10.1111/j.1740-1461.2010. 01190 x
- Ginsburg, B. C. (2019). Strengths and limitations of two cannabis-impaired driving detection methods: A review of the literature. *The American Journal of Drug and Alcohol Abuse*, 45(6), 610–622. https://doi.org/10.1080/00952990.2019.1655568
- Golub, A., Johnson, B. D., & Dunlap, E. (2007). The race/ethnicity disparity in misdemeanor marijuana arrests in New York city. *Criminology & Public Policy*, 6(1), 131–164. https://doi.org/10.1111/j.1745-9133.2007. 00426.x
- Government of Canada. (2019). Cannabis legalization and regulation. *Criminal Justice—Cannabis Laws and Regulations*. https://www.justice.gc.ca/eng/cj-jp/cannabis/
- Greer, A., & Ritter, A. (2020). The legal regulation of drugs and role of government: Perspectives from people who use drugs. *Drug and Alcohol Dependence*, 206, 107737. https://doi.org/10.1016/j.drugalcdep. 2019.107737
- Griffin, O. H., & Miller, B. L. (2011). OxyContin and a regulation deficiency of the pharmaceutical industry: Rethinking state-corporate crime. *Critical Criminology*, 19(3), 213–226. https://doi.org/10.1007/s10612-010-9113-9
- Grucza, R. A., Vuolo, M., Krauss, M. J., Plunk, A. D., Agrawal, A., Chaloupka, F. J., & Bierut, L. J. (2018). Cannabis decriminalization: A study of recent policy change in five U.S. states. *International Journal of Drug Policy*, 59, 67–75. https://doi.org/10.1016/j.drugpo.2018.06.016
- Guttmannova, K., Lee, C. M., Kilmer, J. R., Fleming, C. B., Rhew, I. C., Kosterman, R., & Larimer, M. E. (2016). Impacts of changing marijuana policies on alcohol use in the United States. *Alcoholism: Clinical and Experimental Research*, 40(1), 33–46. https://doi.org/10.1111/acer.12942
- Hall, W. (2015). What has research over the past two decades revealed about the adverse health effects of recreational cannabis use? *Addiction*, 110(1), 19–35. https://doi.org/10.1111/add.12703
- Hall, W. (2017). Alcohol and cannabis: Comparing their adverse health effects and regulatory regimes. *International Journal of Drug Policy*, 42, 57–62. https://doi.org/10.1016/j.drugpo.2016.10.021
- Hall, W. (2018). The future of the international drug control system and national drug prohibitions. *Addiction*, 113(7), 1210–1223. https://doi.org/10.1111/add.13941
- Hall, W., & Degenhardt, L. (2007). Prevalence and correlates of cannabis use in developed and developing countries. Current Opinion in Psychiatry, 20(4), 393–397. https://doi.org/10.1097/YCO.0b013e32812144cc

Hall, W., Stjepanovic, D., Caulkins, J., Lynskey, M., Leung, J., Campbell, G., & Degenhardt, L. (2019). Public health implications of legalising the production and sale of cannabis for medicinal and recreational use. *The Lancet*, 394(10208), 1580–1590. https://doi.org/10.1016/s0140-6736(19)31789-1

- Himmelstein, J. L. (1983). From killer weed to drop-out drug: The changing ideology of marihuana. Contemporary Crises, 7(1), 13–38. https://doi.org/10.1007/BF00808341
- Hoaken, P. N. S., & Stewart, S. H. (2003). Drugs of abuse and the elicitation of human aggressive behavior. *Addictive Behaviors*, 28(9), 1533–1554. https://doi.org/10.1016/j.addbeh.2003.08.033
- Homer, B. D., Solomon, T. M., Moeller, R. W., Mascia, A., DeRaleau, L., & Halkitis, P. N. (2008). Metham-phetamine abuse and impairment of social functioning: A review of the underlying neurophysiological causes and behavioral implications. *Psychological Bulletin*, 134(2), 301–310. https://doi.org/10.1037/0033-2909.134. 2.301
- Hunt, P., & Pacula, R. L. (2017). Early impacts of marijuana legalization: An evaluation of prices in Colorado and Washington. *The Journal of Primary Prevention*, 38(3), 221–248. https://doi.org/10.1007/s10935-017-0471-x
- Hyder, A. A. (2018). D Reducing alcohol-impaired driving: Lessons from a global review. In Y. Negussie, A. Geller, & S. M. Teutsch (Eds.), *Getting to zero alcohol-impaired driving fatalities: A comprehensive approach to a persistent problem* (pp. 1–581). National Academies Press.
- Imtiaz, S., Shield, K. D., Roerecke, M., Cheng, J., Popova, S., Kurdyak, P., Fischer, B., & Rehm, J. (2016). The burden of disease attributable to cannabis use in Canada in 2012. *Addiction*, 111(4), 653–662. https://doi.org/ 10.1111/add.13237
- Johnson, J. K., Johnson, R. M., Hodgkin, D., Jones, A. A., Matteucci, A. M., & Harris, S. K. (2018). Heterogeneity of state medical marijuana laws and adolescent recent use of alcohol and marijuana: Analysis of 45 states, 1991–2011. Substance Abuse, 39(2), 247–254. https://doi.org/10.1080/08897077.2017.1389801
- Johnson, M. B., Kelley-Baker, T., Voas, R. B., & Lacey, J. H. (2012). The prevalence of cannabis-involved driving in California. *Drug and Alcohol Dependence*, 123(1), 105–109. https://doi.org/10.1016/j.drugalcdep. 2011.10.023
- Johnson, W. T., Petersen, R. E., & Wells, L. E. (1977). Arrest probabilities for marijuana users as indicators of selective law enforcement. American Journal of Sociology, 83(3), 681–699. https://doi.org/10.1086/226599
- Jones, C., Donnelly, N., Swift, W., & Weatherburn, D. (2006). Preventing cannabis users from driving under the influence of cannabis. *Accident Analysis & Prevention*, 38(5), 854–861. https://doi.org/10.1016/j.aap.2006.02. 010
- Kilmer, B, & Midgette, G. (2020). Deterring crime: Insights from an individual-level analysis of 24/7 sobriety. *Journal of Policy Analysis and Management*, 39(3), 801–834. https://onlinelibrary.wiley.com/doi/abs/10. 1002/pam.22217
- Kilmer, B., & Pacula, R. L. (2017). Understanding and learning from the diversification of cannabis supply laws. Addiction, 112(7), 1128–1135. https://doi.org/10.1111/add.13623
- Kokkevi, A., Gabhainn, S. N., & Spyropoulou, M. (2006). Early initiation of cannabis use: A cross-national European perspective. *Journal of Adolescent Health*, *39*(5), 712–719. https://doi.org/10.1016/j.jadohealth. 2006.05.009
- Lancione, S., Wade, K., Windle, S. B., Filion, K. B., Thombs, B. D., & Eisenberg, M. J. (2020). Non-medical cannabis in North America: An overview of regulatory approaches. *Public Health*, *178*, 7–14. https://doi.org/10.1016/j.puhe.2019.08.018
- Lenton, S., Humeniuk, R., Heale, P., & Christie, P. (2000). Infringement versus conviction: The social impact of a minor cannabis offence in South Australia and Western Australia. *Drug and Alcohol Review*, 19(3), 257–264. https://doi.org/10.1080/713659365
- Li, M.-C., Brady, J. E., DiMaggio, C. J., Lusardi, A. R., Tzong, K. Y., & Li, G. (2011). Marijuana use and motor vehicle crashes. *Epidemiologic Reviews*, *34*(1), 65–72. https://doi.org/10.1093/epirev/mxr017
- Lu, R., Willits, D., Stohr, M. K., Makin, D., Snyder, J., Lovrich, N., Meize, M., Stanton, D., Wu, G., & Hemmens, C. (2019). The cannabis effect on crime: Time-series analysis of crime in Colorado and Washington State. *Justice Quarterly*, 1–31. https://doi.org/10.1080/07418825.2019.1666903

- Lynch, M., Omori, M., Roussell, A., & Valasik, M. (2013). Policing the 'progressive' city: The racialized geography of drug law enforcement. *Theoretical Criminology*, 17(3), 335–357. https://doi.org/10.1177/13 62480613476986
- MacCoun, R., Kilmer, B., & Reuter, P. (2003). Research on drugs-crime linkages: The next generation. In H. Brownstein & C. Crossland (Eds.), *Toward a drugs and crime research agenda for the 21st century*. National Institute of Justice Special Report.
- MacCoun, R., Pacula Rosalie, L., Chriqui, J., Harris, K., & Reuter, P. (2009). Do citizens know whether their state has decriminalized marijuana? Assessing the perceptual component of deterrence theory. *Review of Law & Economics*, 5, 347–371.
- MacCoun, R., & Reuter, P. (2001). Evaluating alternative cannabis regimes. *British Journal of Psychiatry*, 178(2), 123–128. https://doi.org/10.1192/bjp.178.2.123
- MacCoun, R. J. (2011). What can we learn from the Dutch cannabis coffeeshop system? *Addiction*, 106(11), 1899–1910. https://doi.org/10.1111/j.1360-0443.2011.03572.x
- Macleod, J., Oakes, R., Copello, A., Crome, I., Egger, M., Hickman, M., Oppenkowski, T., Stokes-Lampard, H., & Smith, G. D. (2004). Psychological and social sequelae of cannabis and other illicit drug use by young people: A systematic review of longitudinal, general population studies. *The Lancet*, 363(9421), 1579–1588. https://doi.org/10.1016/S0140-6736(04)16200-4
- Maier, S. L., Mannes, S., & Koppenhofer, E. L. (2017). The implications of marijuana decriminalization and legalization on crime in the United States. *Contemporary Drug Problems*, 44(2), 125–146. https://doi.org/10. 1177/0091450917708790
- Maniglio, R. (2015). Association between peer victimization in adolescence and cannabis use: A systematic review. *Aggression and Violent Behavior*, 25, 252–258. https://doi.org/10.1016/j.avb.2015.09.002
- McAleese, S. (2019). Suspension, not expungement: Rationalizing misguided policy decisions around cannabis amnesty in Canada. *Canadian Public Administration*, 62(4), 612–633. https://doi.org/10.1111/capa.12345
- McCarthy, D. M., Lynch, A. M., & Pederson, S. L. (2007). Driving after use of alcohol and marijuana in college students. *Psychology of Addictive Behaviors*, 21(3), 425–430. https://doi.org/10.1037/0893-164X.21.3.425
- McClelland, G. M., & Teplin, L. A. (2001). Alcohol intoxication and violent crime: Implications for public health policy. *The American Journal on Addictions*, 10(s1), s70–s85. https://doi.org/10.1080/10550490150504155
- Melchior, M., Nakamura, A., Bolze, C., Hausfater, F., El Khoury, F., Mary-Krause, M., & Azevedo Da Silva, M. (2019). Does liberalisation of cannabis policy influence levels of use in adolescents and young adults? A systematic review and meta-analysis. *BMJ Open*, 9(7), e025880. https://doi.org/10.1136/bmjopen-2018-025880
- Miller, J., & Carbone-Lopez, K. (2015). Beyond 'doing gender': Incorporating race, class, place, and life transitions into feminist drug research. *Substance Use & Misuse*, 50(6), 693–707. https://doi.org/10.3109/10826084. 2015.978646
- Miller, T. R., Levy, D. T., Cohen, M. A., & Cox, K. L. C. (2006). Costs of alcohol and drug-involved crime. *Prevention Science*, 7(4), 333–342. https://doi.org/10.1007/s11121-006-0041-6
- Moore, T. M., & Stuart, G. L. (2005). A review of the literature on marijuana and interpersonal violence. *Aggression and Violent Behavior*, 10(2), 171–192. https://doi.org/10.1016/j.avb.2003.10.002
- Morris, R. G., TenEyck, M., Barnes, J. C., & Kovandzic, T. V. (2014). The effect of medical marijuana laws on crime: Evidence from state panel data, 1990-2006. *PloS One* 9(3), e92816–e92816. https://doi.org/10.1371/journal.pone.0092816
- Naimi, T. S., Xuan, Z., Sarda, V., Hadland, S. E., Lira, M. C., Swahn, M. H., Voas, R. B., & Heeren, T. C. (2018). Association of state alcohol policies with alcohol-related motor vehicle crash fatalities among us adults. *JAMA Internal Medicine*, 178(7), 894–901. https://doi.org/10.1001/jamainternmed.2018.1406
- National Survey on Drug Use and Health. (2020). *National survey on drug use and health (NSDUH)*. https://nsduhweb.rti.org/respweb/homepage.cfm
- Nguyen, H., & Reuter, P. (2012). How risky is marijuana possession? Considering the role of age, race, and gender. *Crime & Delinquency*, 58(6), 879–910. https://doi.org/10.1177/0011128712461122

Ostrowsky, M. K. (2011). Does marijuana use lead to aggression and violent behavior? *Journal of Drug Education*, 41(4), 369–389. https://doi.org/10.2190/DE.41.4.c

- Pacula, R. L., Kilmer, B., Wagenaar, A. C., Chaloupka, F. J., & Caulkins, J. P. (2014). Developing public health regulations for marijuana: Lessons from alcohol and tobacco. *American Journal of Public Health*, 104(6), 1021–1028. https://doi.org/10.2105/ajph.2013.301766
- Pacula, R., & Kilmer, B. (2003). *Marijuana and crime: Is there a connection beyond prohibition?* The National Bureau of Economics Research. https://www.nber.org/papers/w10046
- Pardal, M., Queirolo, R., Álvarez, E., & Repetto, L. (2019). Uruguayan cannabis social clubs: From activism to dispensaries? *International Journal of Drug Policy*, 73, 49–57. https://doi.org/10.1016/j.drugpo.2019.06.022
- Pardo, B. (2014). Cannabis policy reforms in the Americas: A comparative analysis of Colorado, Washington, and Uruguay. *International Journal of Drug Policy*, 25(4), 727–735. https://doi.org/10.1016/j.drugpo.2014.05.010
- Passas, N. (2005). Lawful but awful: 'Legal corporate crimes'. *The Journal of Socio-Economics*, 34(6), 771–786. https://doi.org/10.1016/j.socec.2005.07.024
- Patel, H., & Amlung, M. (2019). Elevated cannabis demand is associated with driving after cannabis use in a crowd-sourced sample of adults. *Experimental and Clinical Psychopharmacology*, 27(2), 109–114. https://doi. org/10.1037/pha0000240
- Pedersen, W., & Skardhamar, T. (2010). Cannabis and crime: Findings from a longitudinal study. *Addiction*, 105(1), 109–118. https://doi.org/10.1111/j.1360-0443.2009.02719.x
- Plunk, A. D., Peglow, S. L., Harrell, P. T., & Grucza, R. A. (2019). Youth and adult arrests for cannabis possession after decriminalization and legalization of cannabis. *JAMA Pediatrics*, 173(8), 763–769. https://doi.org/10. 1001/jamapediatrics.2019.1539
- Provine, D. (2011). Race and inequality in the war on drugs. *Annual Review of Law and Social Science*, 7, 41–60. https://doi.org/10.1146/annurev-lawsocsci-102510-105445
- Queirolo, R. (2020). Uruguay: The first country to legalize cannabis. In T. Decorte, S. Lenton, & C. Wilkin (Eds.), *Legalizing cannabis: Experiences, lessons and scenarios* (pp. 116–130). Routledge.
- Reed, M., Kioumarsi, A., Ataiants, J., Fedorova, E. V., Iverson, E., Wong, C. F., & Lankenau, S. E. (2020). Marijuana sources in a medical marijuana environment: Dynamics in access and use among a cohort of young adults in Los Angeles, California. *Drugs: Education, Prevention and Policy*, 27(1), 69–78. https://doi.org/10. 1080/09687637.2018.1557595
- Reinarman, C., Cohen, P. D. A., & Kaal, H. L. (2004). The limited relevance of drug policy: Cannabis in Amsterdam and in San Francisco. *American Journal of Public Health*, 94(5), 836–842. https://doi.org/10. 2105/ajph.94.5.836
- Rogeberg, O., & Elvik, R. (2016). The effects of cannabis intoxication on motor vehicle collision revisited and revised. *Addiction*, 111(8), 1348–1359. https://doi.org/10.1111/add.13347
- Room, R., Fischer, B., Hall, W., Lenton, S., & Reuter, P. (2010). *Cannabis policy: Moving beyond stalemate*. The Beckley Foundation Press in collaboration with Oxford University Press Inc.
- Rusby, J. C., Westling, E., Crowley, R., & Light, J. M. (2018). Legalization of recreational marijuana and community sales policy in Oregon: Impact on adolescent willingness and intent to use, parent use, and adolescent use. *Psychology of Addictive Behaviors*, 32(1), 84–92. https://doi.org/10.1037/adb0000327
- Seddon, T. (2000). Explaining the drug-crime link: Theoretical, policy and research issues. *Journal of Social Policy*, 29(1), 95–107. https://doi.org/10.1017/S0047279400005833
- Sen, A., & Wyonch, R. (2018). Cannabis countdown: Estimating the size of illegal markets and lost tax revenue post-legalization. *C.D. Howe Institute Commentary*, 523. https://doi.org/10.2139/ssrn.3269989
- Shanahan, M., & Ritter, A. (2014). Intangible outcomes from a policy change: Using contingent valuation to quantify potential stigma from a cannabis offence. *Journal of Experimental Criminology*, 10(1), 59–77. https://doi.org/10.1007/s11292-013-9176-1
- Shepard, E. M., & Blackley, P. R. (2016). Medical marijuana and crime: Further evidence from the western states. *Journal of Drug Issues*, 46(2), 122–134. https://doi.org/10.1177/0022042615623983

- Simons-Morton, B., Pickett, W., Boyce, W., ter Bogt, T. F. M., & Vollebergh, W. (2010). Cross-national comparison of adolescent drinking and cannabis use in the United States, Canada, and the Netherlands. *International Journal of Drug Policy*, 21(1), 64–69. https://doi.org/10.1016/j.drugpo.2009.02.003
- Single, E., Christie, P., & Ali, R. (2000). The impact of cannabis decriminalisation in Australia and the United States. *Journal of Public Health Policy*, 21(2), 157–186. https://doi.org/10.2307/3343342
- Smart, R., Caulkins, J. P., Kilmer, B., Davenport, S., & Midgette, G. (2017). Variation in cannabis potency and prices in a newly legal market: Evidence from 30 million cannabis sales in Washington state. *Addiction*, 112(12), 2167–2177. https://doi.org/10.1111/add.13886
- Smart, R., & Kleiman, M. A. R. (2019). Association of cannabis legalization and decriminalization with arrest rates of youths. *JAMA Pediatrics*, 173(8), 725–727. https://doi.org/10.1001/jamapediatrics.2019.1521
- Smart, R., & Pacula, R. L. (2019). Early evidence of the impact of cannabis legalization on cannabis use, cannabis use disorder, and the use of other substances: Findings from state policy evaluations. *The American Journal of Drug and Alcohol Abuse*, 45(6), 644–663. https://doi.org/10.1080/00952990.2019.1669626
- Smith, E. A., McDaniel, P. A., Hiilamo, H., & Malone, R. E. (2017). Policy coherence, integration, and proportionality in tobacco control: Should tobacco sales be limited to government outlets? *Journal of Public Health Policy*, 38(3), 345–358. https://doi.org/10.1057/s41271-017-0074-z
- Statistics Canada. (2019). *Police-reported cannabis offences in Canada, 2018: Before and after legalization*. https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2019055-eng.htm
- Steinemann, S., Galanis, D., Nguyen, T., & Biffl, W. (2018). Motor vehicle crash fatalities and undercompensated care associated with legalization of marijuana. *Journal of Trauma and Acute Care Surgery*, 85(3), 566–571. https://doi.org/10.1097/ta.0000000000001983
- Stevens, A. (2011). Drugs, crime and public health: The political economy of drug policy. Routledge-Cavendish. Studlar, D. T. (2006). Tobacco control policy instruments in a shrinking world: How much policy learning? International Journal of Public Administration, 29(4–6), 367–396. https://doi.org/10.1080/0190069050043 7006
- Subbaraman, M. S. (2016). Substitution and complementarity of alcohol and cannabis: A review of the literature. Substance Use & Misuse, 51(11), 1399–1414. https://doi.org/10.3109/10826084.2016.1170145
- Taylor, S., Buchanan, J., & Ayres, T. (2016). Prohibition, privilege and the drug apartheid: The failure of drug policy reform to address the underlying fallacies of drug prohibition. *Criminology & Criminal Justice*, 16(4), 452–469. https://doi.org/10.1177/1748895816633274
- Teutsch, S. M., Geller, A., Negussie, Y., & Medicine, N. (2018). *Getting to zero alcohol-impaired driving fatalities: A comprehensive approach to a persistent problem*. National Academies Press.
- Tonry, M., & Melewski, M. (2008). The Malign effects of drug and crime control policies on black Americans. *Crime and Justice*, *37*, 1–44. https://doi.org/10.1086/588492
- Toomey, T. L., Erickson, D. J., Carlin, B. P., Lenk, K. M., Quick, H. S., Jones, A. M., & Harwood, E. M. (2012). The association between density of alcohol establishments and violent crime within urban neighborhoods. *Alcoholism: Clinical and Experimental Research*, *36*(8), 1468–1473. https://doi.org/10.1111/j.1530-0277. 2012.01753.x
- Turnbull, P. (2009). The great cannabis classification debacle: What are the likely consequences for policing cannabis possession offences in England and Wales? *Drug and Alcohol Review*, 28, 202–209. https://doi.org/10.1111/j.1465-3362.2008.00045.x
- UNODC. (2019). World drug report 2019. 978-92-4-151024-0. https://wdr.unodc.org/wdr2019/
- Volkow, N. D., Baler, R. D., Compton, W. M., & Weiss, S. R. B. (2014). Adverse health effects of marijuana use. New England Journal of Medicine, 370(23), 2219–2227. https://doi.org/10.1056/NEJMra1402309
- Wadsworth, E., Driezen, P., Goodman, S., & Hammond, D. (2019). Differences in self-reported cannabis prices across purchase source and quantity purchased among Canadians. *Addiction Research & Theory*, 1–10. https://doi.org/10.1080/16066359.2019.1689961

Wadsworth, E., & Hammond, D. (2019). International differences in patterns of cannabis use among youth: Prevalence, perceptions of harm, and driving under the influence in Canada, England & United States. *Addictive Behaviors*, 90, 171–175. https://doi.org/10.1016/j.addbeh.2018.10.050

- Warburton, H., May, T., & Hough, M. (2004). Looking the other way: The impact of reclassifying cannabis on police warnings, arrests and informal action in England and Wales. *The British Journal of Criminology*, 45(2), 113–128. https://doi.org/10.1093/bjc/azh081
- Watling, C., Freeman, J., & Davey, J. (2014). I know, but I don't care: How awareness of Queensland's drug driving testing methods impact upon perceptions of deterrence and offending behaviours. *Modern Traffic and Transportation Engineering Research*, 3(1), 7–13.
- Watson, T. M., & Erickson, P. G. (2019). Cannabis legalization in Canada: How might 'strict' regulation impact youth? *Drugs: Education, Prevention and Policy*, 26(1), 1–5. https://doi.org/10.1080/09687637.2018.1482258
- Watson, T. M., Mann, R. E., Wickens, C. M., & Brands, B. (2019). "Just a habit": Driving under the influence of cannabis as ordinary, convenient, and controllable experiences according to drivers in a remedial program. *Journal of Drug Issues*, 49(3), 531–544. https://doi.org/10.1177/0022042619842375
- Weatherburn, D., & Jones, C. (2001). Does prohibition deter cannabis use? *Contemporary Issues in Crime and Justice*, 58. http://www.cannabislegal.de/studien/nsw/b58.htm
- Wiens, T., Lenk, K. M., Fabian, L. E. A., & Erickson, D. J. (2018). Law enforcement practices in the first two states in U.S. to legalize recreational marijuana. *International Journal of Drug Policy*, 61, 38–43. https://doi.org/10.1016/j.drugpo.2018.08.018
- Wong, K., Brady, J. E., & Li, G. (2014). Establishing legal limits for driving under the influence of marijuana. *Injury Epidemiology*, 1(1), 26. https://doi.org/10.1186/s40621-014-0026-z
- Wortley, S., & Owusu-Bempah, A. (2011). The usual suspects: Police stop and search practices in Canada. *Policing and Society*, 21(4), 395–407. https://doi.org/10.1080/10439463.2011.610198
- Yao, J., Johnson, M. B., & Tippetts, S. (2016). Enforcement uniquely predicts reductions in alcohol-impaired crash fatalities. *Addiction*, 111(3), 448–453. https://doi.org/10.1111/add.13198
- Young, J. (2002). Critical criminology in the twenty-first century: Critique, irony and always unfinished. In K. Carrington & R. Hogg (Eds.), *Critical criminology: Issues, debates, challenges* (p. 304). Willan Publishing.
- Zhu, H., & Wu, L. T. (2016). Trends and correlates of cannabis-involved emergency department visits: 2004 to 2011. *Journal of Addiction Medicine.*, 10(6), 429–436. https://doi.org/10.1097/adm.0000000000000256

## **Author Biographies**

**Benedikt Fischer** (b.fischer@auckland.ac.nz) is the Hugh Green Foundation Chair in Addiction Research, Faculty of Medical & Health Sciences, University of Auckland, New Zealand. His interdisciplinary research focuses on psychoactive substance use, public health, crime and policy, with a strong interest in high-risk and marginalized populations.

**Dimitri Daldegan-Bueno** (dimitridaldegan@gmail.com) is a research associate in the Hugh Green Foundation Addiction Research Chair program, Schools of Population Health and Pharmacy, Faculty of Medical and Health Sciences, at the University of Auckland. His graduate training is in Psychobiology at the Federal University of Sao Paulo, Brazil.

**Peter Reuter** (preuter@umd.edu) is distinguished university professor, School of Public Policy and Department of Criminology, University of Maryland (United States), and a leading scholar on drugs, crime, control and public policy. He directed RAND's Drug Policy Research Center from 1989-1993, and regularly advises international governments and agencies on his matters of expertise.