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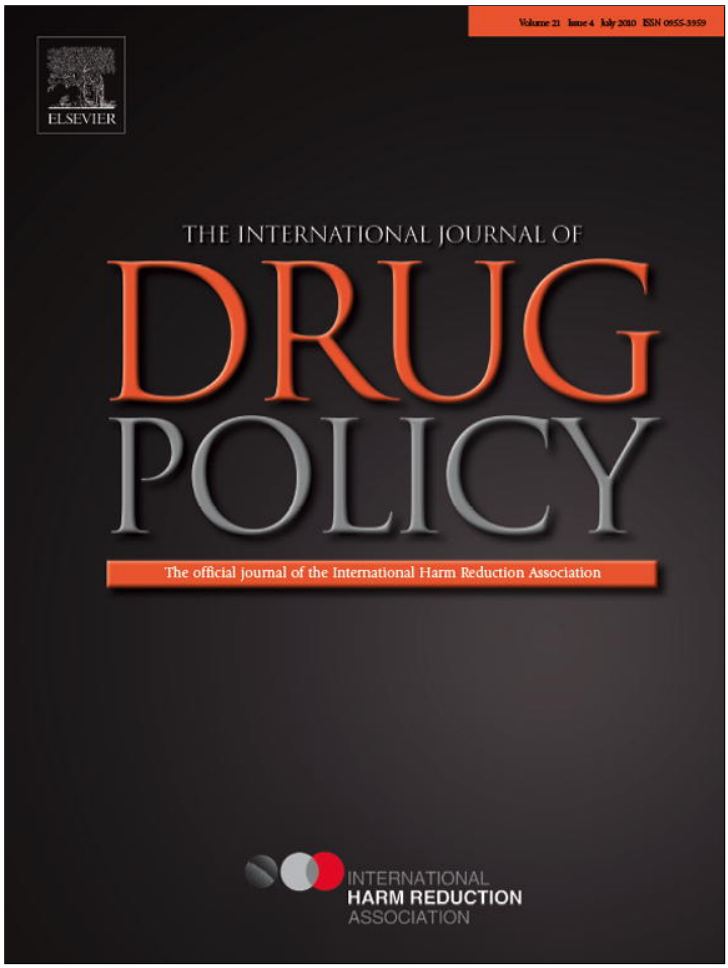

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Editorial

Cannabis policy: Time to move beyond the psychosis debate

Cannabis is the world's most commonly used illicit drug (UNODC, 2008), and a debate over competing policy approaches to govern its use has been at the forefront of the greater discourse concerning the effectiveness of current drug policies. Indeed, the importance of the cannabis question is evident from the many organisations dedicated to research, lobbying, public education and social marketing on both sides of the argument, including Partnership for a Drug-Free America, Drug-Free America Foundation, the NORML Foundation, the Drug Policy Alliance, and many other advocates and lobbyists (DFAF, 2008; DPA, 2010; NORML, 2009; Palmgreen, Lorch, Stephenson, Hoyle, & Donohew, 2007; PDFA, 2010).

Despite the widespread use of cannabis, it remains difficult to quantify the extent of health-related harms associated with its consumption, though researchers have noted that potential associations exist between cannabis use and mental illness, respiratory diseases, and chronic dependence (Kalant, 2004). Heavy cannabis smokers may be at particularly high risk of respiratory complications (Kalant, 2004), though experts have recently questioned the strength of this association (Tashkin, 2009). Cannabis use may also be implicated in causing dependence to the drug amongst heavy users (Hall & Degenhardt, 2009). It is of note, however, that research suggests that the so-called 'gateway effect' theory, in which use of cannabis is theorized to directly cause the subsequent use of harder drugs such as cocaine and heroin, may likely be explained by a common-factor model of illicit drug use that takes into account propensity to use drugs (Fergusson, Boden, & Horwood, 2006; Morral, McCaffrey, & Paddock, 2002). One major challenge in conducting research in this area has been confounding as a result of the co-use of other substances (e.g. tobacco, alcohol and other illicit drugs) by study participants as well as difficulty selecting appropriate controls (Fligiel et al., 1997; Taylor et al., 2002; Tetrault et al., 2007).

Despite the presence of potential bias as a result of confounding in research on the health effects of cannabis use, scientists continue to investigate potential associations between cannabis use and mental illnesses such as psychosis, depression, and related disorders (Moore et al., 2007). In this context, the recent review by McLaren, Silins, Hutchinson, Mattick, and Hall (2009) in *The International Journal of Drug Policy* provides a useful overview of the last 5 years of observational research findings on the potential association between cannabis use and psychosis. The authors investigated the relative methodological strengths and weaknesses of relevant studies through the use of a critical framework founded in Bradford Hill's criteria for causation (Hill, 1977), an approach that prioritizes causative relevance over measures of statistical significance. This methodology is an elegant way to review studies that contain heterogeneity amongst participant samples, statistical modelling techniques, and health outcomes. However, as was strongly argued in the recent Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, it has become widely accepted that the use of a more transparent systematic review process is the optimal way to draw unbiased inferences from published literature (Moher, Liberati, Tetzlaff, & Altman, 2009). As the authors did not adhere to PRISMA guidelines, the review's conclusions are appropriately cautious and its publication is timely considering the mounting intensity of the psychosis question in the debate over cannabis policy (Degenhardt et al., 2009; Nadelmann, 2007; Sabet, 2009). It is noteworthy in this regard that whilst the authors report that an association may exist between cannabis use and psychosis, they conclude that the research to date is insufficient to conclusively claim that this association is causal in nature (McLaren et al., 2009).

As experts have previously noted, it is unlikely that the uncertainty over whether cannabis use causes psychosis will be resolved without further longitudinal study (Moore et al., 2007), and the McLaren review is the latest of a series of reviews and studies to consider this question (Degenhardt & Hall, 2006; Degenhardt et al., 2009; Kalant, 2004; Moore et al., 2007). Given the range of biases (e.g., selection, publication, unmeasured confounding, funding, etc.) that may exist in this area (Fergusson, 2004; McCambridge, 2007; Pearson, 2004; Smit, Bolier, & Cuijpers, 2004), as well as the simple fact that causal inferences cannot easily be drawn from observational research, we would argue that, were it feasible, a randomized clinical trial (RCT) is the only way to sufficiently answer this question. Importantly, such a trial would need to improve upon past observational research (McLaren et al., 2009), and clearly differentiate the effects of acute cannabis intoxication from more persistent psychotic disorders, a critical methodological shortcoming that has plagued past research (Moore et al., 2007). Medical cannabis clinical trials could in theory help to ethically answer this question, but it is unlikely that a medical cannabis trial would be sufficiently powered to compare rates of psychosis. Whilst an adequately powered trial will likely never be conducted, we suspect that the likelihood is high that a properly conducted RCT would disprove any association between cannabis use and a subsequent and persistent psychotic disorder. We base this conclusion on characteristics of the existing observational literature on the potential health harms associated with cannabis, which as a whole consist of study designs and employ methodologies that increase the probability of a false positive finding or of a prevailing bias (Ioannidis,

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2006). Additionally, the fact that population-level rates of psychotic disorders do not appear to correlate with population-level rates of cannabis use suggests that these two phenomena may not be causally related (Degenhardt, Hall, & Lynskey, 2003; Frisher, Crome, Martino, & Croft, 2009). Regardless, given the limitations of available observational study designs and the practical constraints inherent to conducting an RCT, it may prove impossible to come to a broad consensus on the optimal cannabis policy based primarily on a consideration of many of the health effects potentially associated with the use of this drug (Room, Fischer, Hall, Lenton, & Reuter, 2008).

One potential way to integrate research on the direct health effects of cannabis use into effective drug policies is to refocus the debate on the health and social effects of policies regulating the use of cannabis, rather than simply focus on the direct health effects of cannabis use. For example, Degenhardt, Hall, Roxburgh, and Mattick (2007) have noted that during the 1980s and 1990s in Australia, when the intensity of cannabis prohibition differed from state to state, patterns of use appeared to change irrespective of these different policies. Others have pointed out a similar lack of association between severity of penalties for cannabis possession and prevalence of use in the United Kingdom (Lloyd, 2008).

Additionally, as shown in Fig. 1, recent estimates by the US Office of National Drug Control Policy indicate that the purity of cannabis in the US has more than doubled since 1983 despite this drug being a central target of US supply reduction strategies over the last decade (ONDCP, 2007). Global rates of cannabis consumption also remain high despite decades of persistent attempts to reduce consumption through prohibitive measures (Johnston, O'Malley, Bachman, & Schulenberg, 2008; UNODC, 2008). For instance, a study comparing cannabis use in San Francisco and Amsterdam found that differences in policies restricting use and access of this drug had limited relevance to actual patterns of use (Reinarman, Cohen, & Kaal, 2004). This pattern is consistent with findings from the World Health Organization's World Mental Health Survey Initiative, which found that countries with more stringent prohibitive drug policies did not demonstrate lower levels of drug use than countries with policies that focused on alternative approaches (Degenhardt et al., 2008).

In light of the negligible association between cannabis policy and levels of use and supply, we argue that researchers and policymakers should place primary emphasis on examining the negative impacts of these policies themselves. For instance, the United Nations estimates that 3.9% of the global population used cannabis in 2006 (UNODC, 2008). Because of this high prevalence, the global cannabis trade generates massive illegal revenues for criminal organisations, estimated at approximately 140 billion USD per year at the retail level (UNODC, 2005). Aside from the lack of impact of prohibition on consumption and supply in these settings, the massive illicit market that accompanies the prohibition of drugs such as cannabis may be associated with a variety of harms. For instance, studies examining the impact of drug law enforcement on drug-related violence have observed a statistically significant association between violence and levels of drug law enforcement. Experts posit that this violence may result from a proliferation of street gangs involved in the illicit drug trade resulting from the interdiction of larger organisations, as well as from police crackdowns on cannabis markets (Bagley, 2001; Rasmussen, Benson, & Sollars, 1993; Resignato, 2000). It is interesting to note that both Canada and Mexico have also recently experienced severe upsurges in drug-related violence and homicide at least partly attributable to illicit trade in US-destined cannabis (Fainaru & Booth, 2009; Joyce, 2009; Laski, 2009). Additionally, the high rate of cannabis-related arrests, a phenomenon that affects ethnic minority communities in the US in particular, contributes to ongoing racial disparity and mass disenfranchisement in that country (Moore & Elkavich, 2008).

Based on the research to date, the harms associated with the actual use of cannabis likely pale in comparison with the widely observed harms attributable to cannabis prohibition. As such, policymakers should integrate the scientific research conducted on the likely impacts of current prohibitive approaches to cannabis use into the process of optimising cannabis policy. Policymakers should, however, also ensure that policies regulating cannabis use not result in increased incidence or prevalence of use, as experts have cautioned (Advisory Council on Misuse of Drugs, 2008). Importantly, whilst data are extremely limited, emerging evidence suggests that decriminalisation of cannabis use may not necessarily result in a higher prevalence of use. Data from Portugal demonstrate that the decriminalisation of drug use preceded a drop in prevalence of cannabis use in that country. Specifically, lifetime prevalence of cannabis use amongst 7th, 8th, and 9th graders dropped from 11% in 2001 (pre-decriminalisation) to 6% in 2006, whilst amongst 10th, 11th and 12th graders, lifetime prevalence of use dropped from 26 to 19% (Greenwald, 2009). Additionally, Portugal had the lowest lifetime prevalence of cannabis use in the European Union for the period of 2001–2005, and in

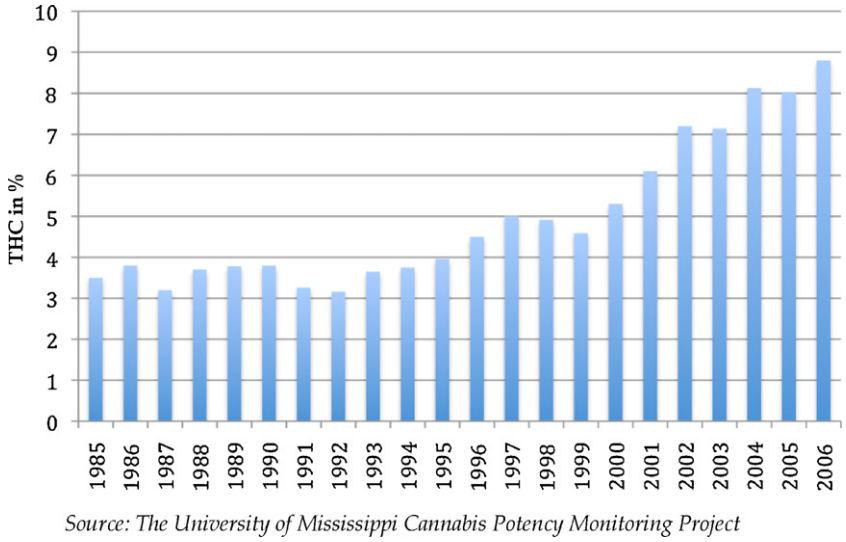

Fig. 1. Average cannabis potency (of seized material) in the United States by year, 1985–2006
Source: The University of Mississippi Cannabis Potency Monitoring Project.

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2006 had a lifetime prevalence of cannabis use of 8% amongst 15–64 year olds, compared with the European Union average of 25% (Greenwald, 2009). Similarly, data from the 2003 European School Survey Project on Alcohol and Other Drugs suggest that in the Netherlands, where cannabis use is *de facto* decriminalised, levels of use amongst high school students in 2003 were lower than levels of use amongst high school students in the US (Hibell et al., 2004). Since drug use rates are believed to be largely driven by cultural factors rather than law enforcement (Reuter, 2006), alternative regulatory or decriminalisation schemes should avoid the negative influences (e.g. advertisement, product placements, etc.) that have emerged under alcohol and tobacco regulation (Garfield, Chung, & Rathouz, 2003; Saffer & Chaloupka, 2000) and should be closely evaluated to ensure that they do not create the unintended consequences that have accompanied prohibition. As previously reviewed (Fischer, Rehm, & Hall, 2009), there are well-described public health models for regulating harmful substances that should be evaluated in the context of cannabis use. For instance, experts have suggested that identifying subpopulations vulnerable to the onset of mental illness may be key to reducing potential cannabis-related harm (Fischer et al., 2009). Additionally, using secondary schools as interventional points for the dissemination of cannabis-related prevention, treatment, and health information through public health staff may be an effective mode of reducing harm and, perhaps, the prevalence of use (Fischer et al., 2009). Indeed, a variety of evidence-based interventions and policy prescriptions for reducing the health-related harms of cannabis use exist (Fischer, Ala-Leppilampi, Single, & Robins, 2003; Fischer et al., 2009; Fischer et al., 1998; Macleod, Smith, & Hickman, 2006; Room et al., 2008), and these deserve greater attention from policymakers. Recent policy recommendations from the United Kingdom Advisory Council on the Misuse of Drugs, which urge a public health approach to reducing cannabis use (Advisory Council on Misuse of Drugs, 2008), provide a potential way forward.

We should stress that we do not wish to be dismissive of the recent review by McLaren et al. (2009), which provides a useful overview of the state of the research on cannabis and psychosis. However, we feel that this latest in a series of reviews clearly delineates the present scientific limits of the debate on the potential association between cannabis and psychosis, and we argue, as have others, that overemphasis on this question by policymakers has distracted from more pressing issues (Degenhardt et al., 2007; Macleod et al., 2006). Clearly, current cannabis policies have failed to stem an increase in purity and consumption in a variety of settings. As such, researchers, research funders and policymakers should give greater voice to the risks and harms associated with particular cannabis policies and to the evaluation of alternative regulatory frameworks. Given the decades of research and experience with cannabis prohibition, it seems reasonable to reorient the cannabis policy debate based on known policy-attributable harms rather than to continue to speculate on questions of causality that will not be definitively answered any time soon (Macleod et al., 2006; Moore et al., 2007).

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Conflict of interest

The authors state that they have no conflicts of interest.

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