

## HARM REDUCTION DIGEST 8

# Cannabis and harm reduction

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### Introduction

Cannabis is typically used experimentally or intermittently in adolescence and early adulthood, and is generally discontinued by the mid- to late 20s [1,2]. While only a minority proceed to long-term regular use, it is by far the most widely consumed illicit drug in many western countries [3]. Approximately 40% of Australians aged 14 years and over have tried cannabis and almost one in five (18%) have used it in the past year [4]. Survey data indicate that the lifetime prevalence of cannabis use in Australia and the United States, particularly among adolescents, has increased throughout the 1990s, after a decline in the 1980s and early 1990s [4–8]. In Australia, the prevalence of lifetime and recent use among female adolescents appears to have almost doubled between 1995 and 1998 [4].

Shortly prior to the 1937 ban on its use, a vigorous campaign was launched by the US Federal Bureau of Narcotics, which portrayed cannabis as a potent narcotic inextricably linked to deviant behaviour. ‘Reefer madness’ led to violent crime, heroin addiction

and social menace. While this view is generally considered extreme today, there is a major schism in the perception of cannabis, with polarized views expressed by vocal opponents. Proponents of its use argue that it is a natural, relatively harmless drug with many beneficial properties, its image tarnished by lies and myths [e.g. 9,10]. Others claim that the harms of cannabis have been understated, and that it is a toxic drug that causes widespread harm [e.g. 11,12].

Cannabis is illegal in most jurisdictions in Australia (and many other countries), although the possession of small quantities has been decriminalized in some states and territories, and there are trials of a range of legal options for low range offences. Since 1985 Australia’s official policy on cannabis and other drugs has been one of harm reduction. There is a spirited debate in Australia and elsewhere about cannabis-related harm. Points of contention include: claimed increases in the potency of cannabis [e.g. 13]; what legislative responses should apply to its possession, use and cultivation; its use as a therapeutic agent for a variety of medical

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### Note from the Editor

*Although cannabis is the most widely consumed illicit drug in many western countries, there is a paucity of information about harm reduction strategies for this drug. In part this may be due to the polarized debate around cannabis which tends to characterize it as wholly evil, or wholly good. In this paper Wendy Swift, Jan Copeland and myself attempt to summarize the major health harms from cannabis use, the harms associated with the application of the law to cannabis use, and offer some harm-reduction strategies. The special case of cannabis use by adolescents is also discussed.*

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conditions; and the most appropriate responses to adolescent use (e.g. school expulsions).

There is also controversy about the definition and scope of harm reduction (HR). Lenton & Single [14], in the opening contribution to this Digest series, made a distinction between HR as a broad policy goal and HR as a strategy. They provided the following practical criteria for assessing whether a policy or programme practices HR. First, the central defining characteristic of HR is a focus on the reduction of *harm* as a primary goal rather than the reduction of *use per se*; it must include strategies for those that continue to use as well as those aimed at reduction of use or abstinence; and there should be some attempt to evaluate whether these strategies will probably result in a net reduction in drug-related harm [14, p.213]. It is important to note that HR is not antithetical to abstinence-orientated programmes and supply reduction strategies. This Digest will, accordingly, cast a fairly wide net and cover issues related to reduction/cessation of use and reduction of harms.

### *Cannabis and harm reduction*

This article aims to use a fairly broad approach to HR issues for a variety of reasons. First, the ability to make causal inferences about the harms associated with chronic use in particular is hampered by a lack of longitudinal research and delays in the manifestation of some adverse health and other effects, and difficulties in ruling out alternative explanations when such delays occur. While HR for cannabis is currently being promoted and practiced by many in the substance use field, discussion of the issue is controversial. Some people consider HR tacit approval of illicit drug use or as synonymous with calls for drug law reform. More specifically for cannabis, the emotive and often irrational policy debate is a major obstacle to the evaluation and realistic reduction of cannabis-related harm, particularly when the type and extent of harms are disputed. The maximization and minimization of harms by opposing camps in this debate compromises the provision of a consistent, believable message, measurement of the costs and benefits of HR initiatives and the evaluation of policy impact [15–17].

Having said that, there is enough reason to be concerned about the probable harms that some people may encounter when using cannabis to promote

discussion and awareness of HR. Cannabis would be unlike all other psychoactive drugs if it was completely benign. As described below, there is research to indicate that when used in particular ways, or by certain people, cannabis is associated with a variety of adverse health and other (e.g. social, employment) outcomes. These harms may be caused more directly by cannabis itself (e.g. health) or stem from current policies on cannabis use (e.g. legal). They may have a range of impacts from an individual to the community level. For the sake of brevity only some of these harms, and associated HR strategies, are outlined below and issues considered to be of particular interest are highlighted. It should be stressed that the following discussion is not an argument for a particular legislative or policy position.

### *Health-related harm*

Acute administration of cannabis has effects on a variety of bodily systems, although these do not necessarily disrupt functioning or predict the long-term effects of cannabis use. For example, while acute administration of small doses of cannabis produces bronchodilation, chronic use may produce obstructive airways disease [18]. The risk of experiencing severe toxic effects is limited by the aversive psychotropic effects produced by the high doses required. This typically leads to the cessation of use before the onset of dangerous symptoms [19]. However, the effects of cannabis are variable and may also be mediated by factors other than dose, including method of use, drug experience, tolerance, concurrent drug use, expectations and personality [20].

Cannabis has a very low acute toxicity [21] and is only a minor contributor to drug-related mortality [22–24]. Its major public health significance resides in its association with morbidity [15]. The public health significance of these outcomes is affected not only by their severity but by the prevalence of cannabis use. As most cannabis use is experimental and intermittent, and the patterns of use producing long-term outcomes relatively rare, the greatest *number* of people will experience the acute negative effects [15]. However, in terms of the relative *likelihood* of experiencing the adverse health consequences of use, the major health risks are more likely to be experienced among regular, long-term users [25]. On the basis of *current use patterns*, it has been estimated that cannabis produces only small to moderate public

health risks and makes only a small contribution to the global burden of disease, compared with the most prevalent drugs, alcohol and tobacco [15,25,26].

Despite this comparatively smaller public health burden, as the most prevalent illicit drug cannabis has the potential to cause distress and a number of potentially serious adverse consequences to a large number of people, particularly those who persist in their use over many years. Recent authoritative reviews employing explicit evidential standards have summarized the major *probable* health effects of acute and chronic cannabis use based on the available evidence [e.g., 19, 27, 28]. These are summarized below.

#### *Probable acute harms*

The most *probable* adverse health effects of acute use, which are generally self-limiting and do not persist beyond intoxication, are:

- negative psychological effects such as anxiety, dysphoria, panic and paranoia. These effects may be particularly pronounced in naive users, and contribute to the occurrence of panic attacks;
- disruption of cognitive function (e.g. memory, learning and temporal processing) and psychomotor impairment [29,30]. Cannabis use could be viewed as potentially disruptive of everyday behaviours reliant on complex cognitive processing. Psychomotor impairment may also increase the risk of accidents while driving or operating machinery. While cannabis is the second most frequently detected drug in road accidents after alcohol [31], its causal role in these events is debated. For example, in comparison to the risky behaviours induced by alcohol consumption, those intoxicated by cannabis *alone* may recognize their impairment and attempt to compensate by driving more slowly, refraining from overtaking and focusing attention on anticipated tasks. Nevertheless, such compensations may be offset by the occurrence of unexpected events, lack of control of the surroundings, or when sustained attention is required [see 20,29,30]. Cannabis and alcohol, which are frequently used together, may be additive in their effects on psychomotor impairment and driving performance [32]. Thus, cannabis may amplify alcohol-induced impairments; and
- an increased risk of experiencing psychotic symptoms among vulnerable individuals [33].

#### *Probable chronic harms*

In addition, the most *probable* effects of regular (daily or near daily), sustained use (over several years) are:

- a cannabis dependence syndrome, characterized by a variety of cognitive, physical and behavioural symptoms, such as an inability to control use, continued use despite problems, withdrawal and tolerance [e.g. see 34]. The chronic use patterns associated with dependence may be resistant to change, increasing the likelihood of experiencing other adverse outcomes. Cannabis dependence has the potential to create significant costs in terms of provision of treatment services for those who wish to stop and reduced work or educational performance. Further, the experience of dependence may be distressing quite apart from other more obvious adverse experiences, and may interfere with normal daily functioning and the enjoyment of life;
- subtle cognitive impairment, affecting attention, memory, and the organization and integration of complex information. At present, these impairments do not appear to be grossly debilitating, and their reversibility is unknown [35];
- adverse respiratory effects, such as chronic bronchitis and histopathological changes which may be precursors to cancer [36]. Route of administration is obviously a major mediator of this risk, with smoking the almost universal mode of use. In Australia, waterpipes ('bongs') are the most frequently used smoking device, particularly among younger users [13]. Cannabis and tobacco smoke contain many carcinogenic compounds and respiratory irritants [37,38]. Research suggests that waterpipes may deliver greater concentrations of tar, partly because the smoke is inhaled more deeply and held for longer [39]. In addition, many smokers mix cannabis with tobacco, and are regular tobacco smokers. There is evidence that some of the negative respiratory effects of cannabis and tobacco may be additive [36].

#### *High-risk groups*

Certain groups may be at a higher risk of developing the adverse acute and chronic effects of cannabis [see 19,27,28]. These include:

- adolescents (this issue is discussed below);
- pregnant women: continued smoking throughout pregnancy may increase the risk of having a low birth weight baby;

- those with respiratory or cardiovascular disease, whose conditions may be aggravated by use;
- those with a co-morbid disorder: the co-occurrence of two or more substance use disorders (e.g. cannabis and alcohol use disorders), or substance use and other mental health disorders (e.g. substance use disorders and anxiety or depression) is relatively common [40]. In general, those with co-morbid disorders have been shown to experience greater disability and poorer outcomes than those with a single disorder [e.g. 40,41]. Those with schizophrenia may be particularly susceptible to the effects of cannabis. There is evidence that use may exacerbate psychotic symptoms in those with the disorder, and long-term, heavy use may precipitate schizophrenia in vulnerable individuals [33].

### *Health-related harm reduction*

There are a number of strategies aimed at reducing the harms associated with the adverse health outcomes listed above. Some may be more orientated to reduction or cessation of use, while others target the reduction of specific harms without necessarily entailing major changes in frequency or quantity of use. Harm reduction tips have been produced in many formats and from such diverse sources as drug and alcohol and generalist health services, user groups, Dutch ‘coffee shops’ and the police service.

While a key challenge is to develop appropriate messages, in acceptable media, for relevant target groups, some broad HR tips pertinent for the probable harms cited above are listed below. The most obvious advice in order to avoid harm is not to smoke. However, this is not necessarily acceptable or desirable to many users, who may simply wish to minimize the risk associated with use. It is important not to underestimate the benefits cannabis use is perceived to provide (e.g. relaxation, ‘time out’), which may be powerful motivators for continued use despite the simultaneous recognition of cannabis-related problems. Some users perceive cannabis use to be a form of harm reduction in itself, because they believe that it creates less problems for them than other drugs such as alcohol [42,43].

First, as with other drugs, information is the first weapon against harm. It is well known that knowledge does not necessarily ensure behaviour change. However, the provision of accurate and empirically based, non-sensational, timely and acceptable information on the probable risks associated with short- and long-term

cannabis use is a vital aid for users making informed decisions about whether, or how, to use cannabis, and when use might be becoming a problem.

*Adverse psychological effects.* If users are prone to experiencing anxiety, paranoia and panic when smoking, the best advice is not to use. For those who choose to continue smoking, setting limits on the amount smoked, not mixing cannabis with drugs that could heighten such feelings and smoking in a safe environment with trusted friends who can provide reassurance, may limit their occurrence or the severity of their effects. It is important for users to be aware that for most, such unpleasant feelings will pass. Those who are schizophrenic or are prone to psychotic symptoms need to be aware of the possibility of exacerbating such symptoms or precipitating a schizophrenic episode. While limiting use may alleviate minor psychological discomfort in most users, in this group abstinence is the most advisable HR measure due to the serious and distressing nature of symptoms.

*Psychomotor impairment.* While the extent to which cannabis is implicated in accidents is debated, any psychomotor impairment may decrease the likelihood of coping successfully in an unexpected situation or emergency, putting the user and others at risk. Again, users should be advised not to smoke before driving a vehicle or operating machinery, especially if the task is unfamiliar or requires sustained attention. In particular, they should be advised against mixing cannabis and alcohol in this context. Users should also be aware of the potential of experiencing a ‘hangover’ the morning after a heavy smoking session.

A controversial strategy aimed at reducing potential harms arising from drug-related impairment and increasing work-place productivity is drug testing. This policy has been criticized by some commentators [e.g. 44], who argue that it measures drug exposure rather than actual impairment, there is little baseline information on the prevalence of substance use and substance-related impairment in the workplace on which to base its application, and little evidence that drug testing actually increases safety or productivity. Given the retention of cannabis in body tissue for up to several weeks, such testing is not an accurate reflection of use recency or impairment. While such programmes may provide benefits by acting as a deterrent to drug use for some [44], these must be traded against potential social costs (e.g. loss of employment) which may be consequent to testing.

*Respiratory harm.* The risk of spreading infectious disease such as influenza can be decreased by not sharing joints and bongs and cleaning smoking equipment regularly. Eating cannabis or drinking cannabis tea will eliminate smoking-related harms. This recommendation may not be readily accepted because it is difficult to titrate the dose when consumed orally, and patience is required for the onset of effects which are less predictable than when smoked [20,45]. As most users prefer smoking, harm may be reduced by avoiding mixing with tobacco, smoking joints rather than waterpipes and avoiding inhaling deeply. Vaporizers, which heat (rather than burn) the cannabis and trap toxins inside the apparatus, are a potentially viable alternative to the most commonly used smoking devices. However, it has been suggested that they may not be as efficient at delivering THC as other smoking routes, and that users may need to ingest more smoke to achieve the desired intoxication [46]. It has also been suggested that smoking higher-potency cannabis may reduce the amount of smoke inhaled because users would become intoxicated more quickly [e.g. 46]. There is mixed evidence that cannabis users are able to titrate the amount of THC by varying their smoking technique [e.g. 47,48]. The health effects of an increase in THC potency are unknown; however, it is possible that any potential respiratory benefits of this technique may be offset by an increase in adverse effects (e.g. psychological effects) [13].

*Cognitive impairment.* The impairment associated with chronic use may be very subtle and not easily extrapolated into everyday situations. However, impairments of attention and memory suggest that, if users are concerned about the impact of regular smoking on their daily performance and interactions with others, they seek assistance to moderate their use, or at least limit their consumption the night before an important or unfamiliar task. Again, they should be aware of the 'hangover' effects cannabis can produce.

*Dependence.* On the basis of epidemiological literature, approximately one in 10 people who have ever tried the drug meet criteria for dependence. This risk increases with frequency and duration of use, with daily or near-daily users at highest risk of becoming dependent [19]. While it is important not to overstate the risk of developing dependence, users need to be aware of this possible consequence of sustained, regular use. Cannabis dependence has often been trivialized as of little clinical relevance, and while many users can control their use without help [e.g. 42,49],

some experience significant problems and seek professional assistance to reduce or cease use. Users prefer [49], and need to be aware of, a range of intervention options. HR strategies will vary according to how entrenched use patterns and associated problems have become, and the goals of the individual concerned.

Self-help materials, some of which use a cognitive-behavioural approach, have been developed to assist in this process [e.g. 50]. They may include tips on how to manage withdrawal symptoms; removing associated paraphernalia such as mull tins and bongs; monitoring cues to use and planning appropriate alternative activities and responses; and relapse prevention tips. Although plausible, none of these materials has been evaluated independently.

There has been little systematic development of more comprehensive interventions designed for cannabis dependence, with many being adaptations of alcohol interventions [e.g. 51,52]. Marijuana Anonymous (MA) is a developing programme in the United States but has not been established successfully in Australia. Controlled trials of cannabis interventions have used aversion therapy [53] and supportive expressive psychotherapy [54] and, as with MA, their efficacy has not been clearly established.

A randomized controlled trial of cognitive-behavioural therapy (CBT) for cannabis dependence [55] compared group-delivered CBT with a basic skills training approach, both of which were tailored specifically for cannabis dependent clients. At 12 months follow-up there were substantial reductions in number of days of cannabis use and cannabis problems, compared with pretreatment, but no differences in rates of abstinence (14.5%) between the two treatment groups. Abstinence rates were comparable to those reported for the alcohol [56] and tobacco smoking cessation [57] fields. This research offers a promising, empirically verifiable approach to the treatment of cannabis dependence, and clearly warrants further investigation.

A recently completed Australian randomized controlled trial of 229 severely dependent cannabis users evaluated an individualized CBT approach [58]. Participants were assessed and randomized to: (a) a six-session intervention package incorporating a motivational interview and a standard relapse prevention intervention; (b) a one-session version of the more intensive intervention with a self-help booklet; and (c) assessment and placement on a 24-week waiting-list control group.

Preliminary findings suggest that while continuous abstinence rates at approximately 8 months were low, they were consistent with those found in similar studies of brief interventions for other drugs. There was a significant impact on frequency and amount of cannabis used and in the associated harms, including relationships, family and work-related issues, and on levels of depression and feelings of dependence.

These studies suggest that CBT, even briefly applied, may be an effective approach in the reduction of cannabis use and associated harms among severely dependent users. There is considerable scope for the training of primary health-care providers in the assessment and treatment of cannabis dependence. A research priority is to better understand the process by which occasional cannabis use becomes dependence, how best to assist people in the earlier stages of dependence and how to improve abstinence rates among the severely dependent.

#### *Legal harm*

A range of harms stem from the legislative and criminal justice systems which aim to prohibit the use of cannabis. These harms may be experienced by cannabis-using individuals, their families and friends and the general community. The public health consequences of the application of the criminal law against cannabis users may be at least as significant as those that flow directly from cannabis use itself [59–61] although, as noted above, some of the longer-term effects have yet to be realized. Recent research indicates that most people who receive a criminal conviction for a minor cannabis offence are otherwise law-abiding [62]. While a conviction can have significant adverse impacts on employment, further involvement with the criminal justice system, relationships and accommodation, it fails to deter cannabis use in many of those convicted [63]. Research has failed to show that removing criminal penalties for personal use has led to an increase in the number of regular cannabis users in the general community [64,65].

### **Harms associated with cannabis law enforcement**

Law enforcement-related harms experienced by individuals and the general community include:

- under a total prohibition approach there are considerable financial costs related to the application of police, judicial and corrective services

resources to prosecute minor cannabis offences such as possession/use, minor cultivation offences and paraphernalia offences [66–70]. In 1996–97 cannabis offences constituted about 81% of all drug arrests in Australia [67]. Between 70 and 90% of cannabis offences are minor offences [62,68]. The financial costs of infringement notice systems have been shown to be far less than those associated with strict prohibition [69,70];

- there may be considerable social costs to individuals who are convicted of minor cannabis offences and acquire a criminal record, in terms of impacts on employment, further involvement with the criminal justice system, relationship problems and restrictions on international travel [61,71–73]. These costs are far greater than those experienced by those receiving an infringement notice under a system where civil penalties apply [63];
- there is an overlap of illicit markets for cannabis and other potentially more harmful illicit drugs, and some evidence that when cannabis users go to the existing illicit market to buy their cannabis they are exposed to a range of other illicit drugs [73,74];
- there are community costs resulting from the involvement of criminal elements in the illicit cannabis market. There is considerable evidence of organized crime involvement in large-scale cannabis production and distribution in Australia [67,68]. This brings considerable additional risks to the wider community [67,75,76], including the ‘fairly common use of ‘booby traps’, armed guards and large, spring-loaded animal traps to protect sizeable outdoor crops [67]. In South Australia there is some evidence that the previous 10-plant expiation limit was being exploited by commercial cannabis cultivation enterprises spreading their operations across smaller plantations [77]; and
- recent investigations into police corruption in Australia have uncovered examples of cannabis-related police corruption which involve large amounts of cannabis and money [78–80].

### **Legal issues for cannabis users**

Many users may be unaware of the consequences of a cannabis conviction, and wrongly believe they are trivial. Apprehension and court appearance may be seen as an opportunity to make a socio-political ‘statement’ or voice opposition to the laws (in court, for example), while perhaps not considering the personal ramifications.

There is evidence that a significant minority of cannabis users facing legal sanctions are uninformed about the relevant laws [73,81]. Laws and associated penalties differ across Australian states and territories regarding the details of the offences, whether civil or criminal penalties apply, use of cautions, levels of fines imposed, consequences of failing to pay within the specified period and other procedural factors [82]. Additionally, there is variability in how cannabis laws are enforced by police.

*Avoid coming to the attention of the law.* Clearly, not using cannabis is the best way to avoid the consequences of the law; however, in some jurisdictions even being on the premises, or owning premises where cannabis is knowingly being consumed, can be a criminal offence [e.g. 62]. There are several common-sense tips for reducing the likelihood of being brought to the attention of police. These include not smoking in public or with strangers. Given that a number of minor cannabis apprehensions are often incidental to other police enquiries [73,81] users should be advised against carrying cannabis or smoking utensils on themselves or in their vehicle, and not behaving in ways that would otherwise bring themselves to police attention.

*The court experience.* Even in some total prohibition systems those charged with minor cannabis offences may avoid the public nature of the court process by pleading guilty on the back of a summons and not appearing in court. However, those that do should be aware that they will still receive a criminal record and be aware of the consequences of this. Less than half of a sample of Western Australian cannabis offenders that appeared in court had any legal representation, and only a fifth spoke to a lawyer prior to their appearance [73]. Cannabis users facing court should seek and heed legal advice from lawyers, court officers or duty counsel, and in particular should behave in a way which is respectful of the court and its officers.

*Harm reduction for those convicted of a cannabis offence.* Those convicted will need to decide whether to tell a prospective employer about their criminal record. Furthermore, cannabis users need to understand that on efficiency grounds police may decide to more vigorously investigate people who they come in contact with who are known to have a prior drug history. This may be the case for prior convictions, cautions or charges not proceeded with that may appear on the police record system that can be accessed by police on patrol. Those who receive infringement notices should also know what penalties apply for failing to pay within

the prescribed period. Those who are convicted of a cannabis offence should know whether they can apply to have the record expunged and after what period of time.

The consequences of having a criminal record may also have been magnified by the establishment of the national and international databases of police intelligence. In this way cannabis conviction data may no longer be subject to jurisdictional rules on expungement of convictions, and follow the person throughout their life as they apply for passports, visas and negotiate other criminal conviction clearance procedures.

### *Adolescents*

A major focus of concern is cannabis use in adolescence, a time of rapid development and transitions in life roles. While most adolescent use remains experimental, early onset and adolescent cannabis use have been related to a number of negative outcomes such as poor mental health, drug use and abuse, delinquent behaviour and criminality and poor educational achievement [e.g. 83–87]. Recent reviews of this literature [e.g. 3,88,89] have concluded that there is no simple cause and effect relationship between the extent of cannabis use and other outcomes. Rather, these associations arise because of common or overlapping risk factors and life pathways between young people who may be predisposed to cannabis use and those at increased risks of these other outcomes.

Epidemiological data have shown that adolescents may be significantly more likely to develop cannabis dependence for a given dose than adults [90]. A study of adolescents in treatment for drug use disorders reported that 78.6% met adult criteria for DSM-III-R cannabis dependence [91], while 8.6% of 18-year-old males met criteria in a population-based New Zealand longitudinal study [92].

Research by the NSW Bureau of Crime Statistics and Research and others shows a strong relationship between frequent cannabis use by juveniles and their participation in crime [93–95]. Research indicates that juveniles resort to income-generating property crime to fund their consumption of cannabis and other drugs [96]. There is a serious gap in the development of effective services for young people who use cannabis at problematic levels [97].

Patterns of cannabis use among young people have changed over the past few decades, reflected in a decrease in age of initiation and the preference for the

more potent plant preparations (e.g. heads) [13]. These patterns of use may make continued use and dependence an increasingly likely consequence of adolescent cannabis use. The paucity of information on correlates and consequences of cannabis use among adolescents, particularly its relationship to co-morbid psychopathology, have allowed an ill-informed and polemical community debate around cannabis to flourish. As a result, young people are increasingly sceptical about public messages on the harms associated with cannabis use: those aged 14–19 are more likely to be recent cannabis than tobacco users (34.6% vs. 24.8%) [4]. The apparent doubling of reported cannabis use among adolescent females in the last 3 years [4] has eliminated the traditional gender difference in use prevalence. This has relevance for the development of appropriate drug education strategies.

While there is a great deal of political pressure for the widespread implementation of school-based drug education, the consensus is that such approaches have no significant outcome on drug-related behaviours or public health [98,99]. Indeed, some programmes have been shown to increase the likelihood of subsequent substance use [100]. A project specifically targeting cannabis use has reported some positive effect on self-reported attitudes to cannabis use and future use intentions [101]. Drug education models require rigorous longitudinal evaluation. As a recent review concludes, school-based programmes should at least be based on educational principles rather than drug ideology, incorporated into many aspects of the curricula on an ongoing basis and be consistent with the range of harm reduction objectives [102].

There are no published controlled studies of interventions for adolescents with cannabis-related problems. As adolescents are not a group that initiates treatment, novel programmes are required. A ‘check-up’ style of approach that involves families in a non-confrontational and realistic discussion of the harms associated with heavy cannabis use would be worthy of investigation. A potential barrier to intervention among adolescents is their scepticism about drug-related messages generally, which may be heightened by parents who may try and emphasize the risks or, alternatively, unintentionally model cannabis and other drug-use behaviour themselves.

#### *Assessing the effectiveness of HR for cannabis*

Lenton & Single [14] note that in practice it is not necessarily possible to measure the costs and benefits

of HR strategies. In reality, it may be necessary to demonstrate probable impacts based on similar approaches, or to use surrogate indicators of harm. This may be particularly apt for cannabis, which presents several practical difficulties for implementing and assessing the impact of HR measures. Better longitudinal epidemiological data are required to clarify the extent and nature of cannabis-related harms, particularly those that are subtle and/or may take years to manifest. The illicit, unregulated nature of the cannabis industry means that currently little or no controls can be enacted to enhance product safety (cf. standard drink labelling, reducing the nicotine content of cigarettes). There are no known and recommended ‘safe’ levels of cannabis use.

Nevertheless, the current state of play should not prevent the development and evaluation of strategies, if they are deemed to decrease the likelihood of probable harms without exacerbating others. A major challenge is to discover a balance between HR approaches (e.g. demand vs. subsequent harm reduction; individual vs. community policy), and the most appropriate and acceptable messages and media by which to deliver them. The impacts of these strategies may also take time to manifest, and they may be subtle. For example, unlike the potentially more measurable and immediate impact of HR strategies on morbidity and mortality for other drugs such as opiates, alcohol and tobacco, the public health impact of HR strategies implemented for the reduction of cannabis-related morbidity may not be immediately obvious or easily measurable. It may be necessary to extrapolate where appropriate the impact of HR strategies for other drugs. An obvious and relatively straightforward area for evaluation is the impact of self-help booklets, education and treatment interventions for cannabis-related problems, particularly cannabis dependence.

It is important to be realistic and flexible in the approach to cannabis-related harms and to continue to incorporate research findings in HR strategies where possible. Imperfect messages about the harms of cannabis and how to avoid or reduce them are better than none at all, or the opposing sets of implausible assessments that mark contemporary debates.

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