



European Monitoring Centre  
for Drugs and Drug Addiction

# EMCDDA

---

# MONOGRAPHS

A cannabis reader: global issues and local  
experiences

Perspectives on cannabis controversies, treatment and  
regulation in Europe

**Editors**

Sharon Rödner Sznitman, Börje Olsson, Robin Room

8  
VOLUME II



## Legal notice

This publication of the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) is protected by copyright. The EMCDDA accepts no responsibility or liability for any consequences arising from the use of the data contained in this document. The contents of this publication do not necessarily reflect the official opinions of the EMCDDA's partners, any EU Member State or any agency or institution of the European Union or European Communities.

A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu>).

Europe Direct is a service to help you find answers to your questions about the European Union

Freephone number:

**00 800 6 7 8 9 10 11**

This publication should be referenced as:

EMCDDA (2008), *A cannabis reader: global issues and local experiences*, Monograph series 8, Volume 2, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.

References to chapters in this monograph should include, where relevant, references to the authors of each chapter, together with a reference to the wider publication. For example: Corrigan, D. (2008), 'The pharmacology of cannabis: issues for understanding its use', in: *A cannabis reader: global issues and local experiences*, Monograph series 8, Volume 1, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.

The publication is available on the Internet at:

<http://www.emcdda.europa.eu/publications/monographs/cannabis>

Cataloguing data can be found at the end of this publication.

Luxembourg: Office for Official Publications of the European Communities, 2008

ISBN 978-92-9168-312-3

© European Monitoring Centre for Drugs and Drug Addiction, 2008

Reproduction is authorised provided the source is acknowledged.

*Printed in Belgium*



European Monitoring Centre  
for Drugs and Drug Addiction

Rua da Cruz de Santa Apólonia 23–25, P-1149-045 Lisbon  
Tel. (351) 21 811 30 00 • Fax (351) 21 813 17 11  
[info@emcdda.europa.eu](mailto:info@emcdda.europa.eu) • <http://www.emcdda.europa.eu>



## Acknowledgements

The European Monitoring Centre for Drugs and Drug Addiction would like to thank all authors, editors and reviewers who have worked on this publication. In particular, the monograph benefited from overall editorial commissioning by Sharon Rödner Sznitman, Börje Olsson and Robin Roomat Sorad in Sweden (including the volume summaries and general management of submissions), external reviewers drawn from the EMCDDA's Scientific Committee, internal staff and Reitox national focal points, and the scientific editors John Witton and Wendy Swift. Internal work on the monograph at the EMCDDA has been managed by Linda Montanari (project manager), Paul Griffiths (scientific coordinator), and Peter Thomas (editor). Production of this monograph was carried out by Prepress Projects Ltd.







# Contents

<b>Introduction</b>	<b>ix</b>
<b>Foreword</b> Paul Griffiths	<b>xiii</b>
<b>Overview of Volume 2</b> Peter Thomas and Sharon Rödner Sznitman	<b>xix</b>

## Part I: Epidemiology

---

<b>Chapter 1: Prevalence, patterns and trends of cannabis use among adults in Europe</b> Julian Vicente, Deborah Olszewski and João Matias	<b>3</b>
<b>Chapter 2: Measuring cannabis-related problems and dependence at the population level</b> François Beck and Stéphane Legleye	<b>29</b>
<b>Chapter 3: Patterns of cannabis use among students in Europe</b> Björn Hibell and Barbro Andersson	<b>59</b>
<b>Chapter 4: Cannabis in the context of polydrug use: results from the Dutch National School Survey</b> Karin Monshouwer, Filip Smit and Jacqueline Verdurmen	<b>79</b>
<b>Chapter 5: Cannabis users and their relation to Finnish society</b> Taru Kekoni	<b>97</b>

## Part II: Health effects of cannabis use

---

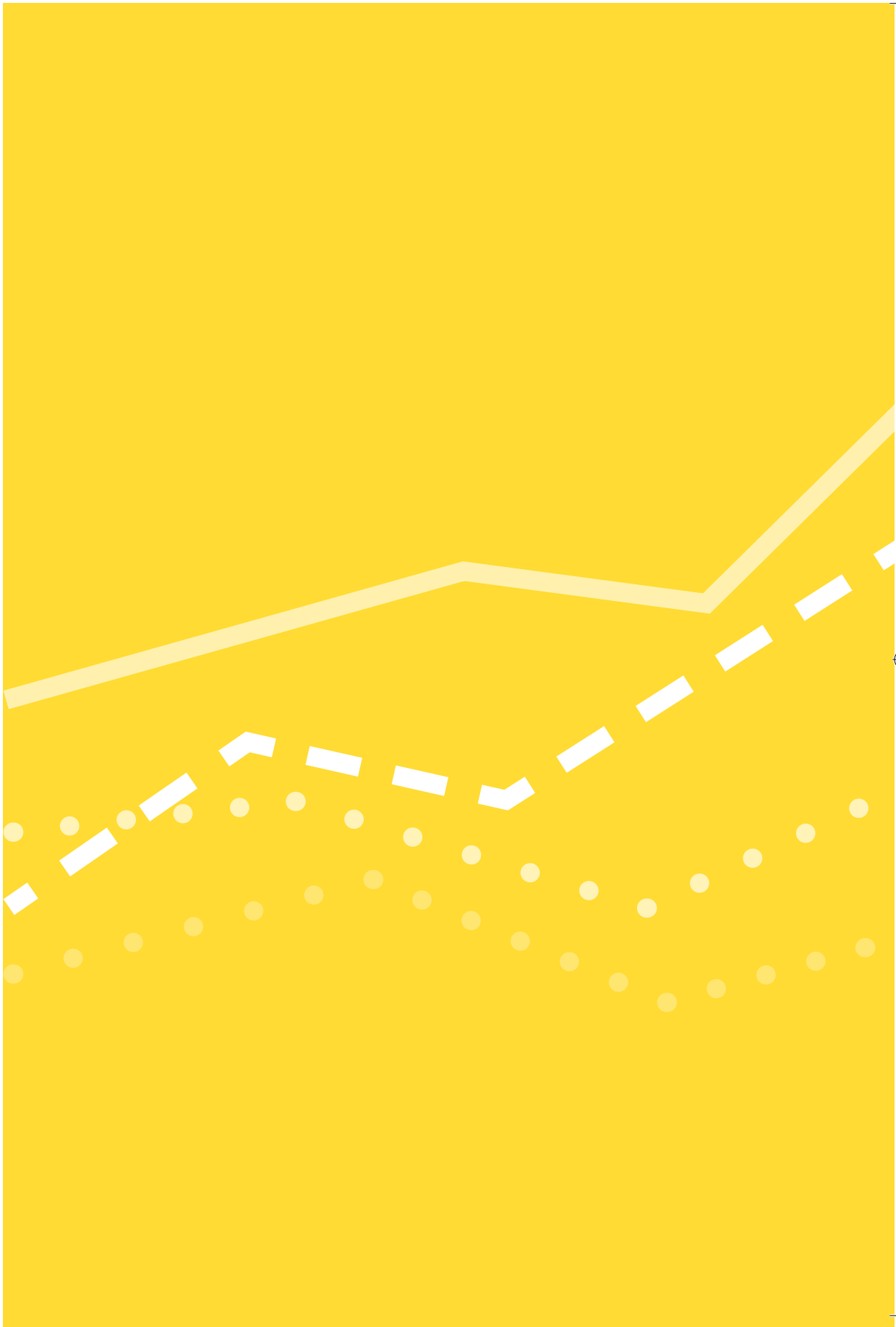
<b>Chapter 6: Cannabis use and physical and mental health</b> John Witton	<b>115</b>
<b>Chapter 7: The public health significance of cannabis in the spectrum of psychoactive substances</b> Robin Room	<b>143</b>
<b>Chapter 8: Assessing the population health impact of cannabis use</b> Wayne Hall	<b>157</b>



## Contents

<b>Chapter 9: Cannabis use and driving: implications for public health and transport policy</b>	<b>173</b>
Robert E. Mann, Gina Stoduto, Scott Macdonald and Bruna Brands	
<b>Part III: Prevention and treatment</b>	
<hr/>	
<b>Chapter 10: Treating cannabis use disorders: perspectives and best practices</b>	<b>203</b>
Anders Bergmark	
<b>Chapter 11: Cannabis prevention in the EU</b>	<b>217</b>
Gregor Burkhart	
<b>Chapter 12: Moving towards evidence-based practice: school-based prevention of substance use in the USA</b>	<b>247</b>
Zili Sloboda	
<b>Chapter 13: Cannabis users in drug treatment in Europe: an analysis from treatment demand data</b>	<b>261</b>
Linda Montanari, Colin Taylor and Paul Griffiths	
<b>Chapter 14: Cannabis treatment in Europe: a survey of services</b>	<b>279</b>
Sharon Rödner Sznitman	
<b>Chapter 15: Has treatment demand for cannabis-related disorders increased in Germany?</b>	<b>305</b>
Roland Simon and Ludwig Kraus	
<b>Chapter 16: Risk factors for cannabis use</b>	<b>325</b>
Niall Coggans	
<b>Appendix: approaching cannabis research — a quick guide</b>	<b>347</b>
<b>Index</b>	<b>355</b>











## Introduction

Smoked, eaten, imbibed — or just talked about — it seems the world has a strong appetite for cannabis. An estimated one in five European adults have tried it. Thirteen million Europeans have consumed it in the past month. Nearly 50 000 tonnes of cannabis herb or resin is produced for consumption each year. Little wonder, then, that cannabis has become a controversial cultural and commercial phenomenon. Today, cannabis has a unique ability to divide opinion among policymakers, scientists, law enforcers, drugs professionals and consumers.

This EMCDDA cannabis monograph addresses one basic question. *How can I find quality information on cannabis, amid all the bias and opinion?* During the editing of this monograph it soon became clear that the EMCDDA was entering an area crowded with general guides, even competing cannabis monographs. This is where the idea of a cannabis ‘reader’ emerged. Our audience — researchers, parliamentarians, drugs professionals, students, European citizens — is currently faced with an overload of professional publications. Added to this is the daily flood of information on the Internet, often crusading in nature, and sometimes misleading. This threatens to obscure the genuine progress made in cannabis research during the past two decades.

The EMCDDA cannabis reader underlines the point that cannabis is not just a static, unchanging plant, but a dynamic product that is subject to gradual evolution in potency, prevalence, cultivation, legislative and public health concerns. In this monograph, leading experts provide short, sharp insights on a range of cannabis topics while offering advice on further reading for each topic. Brief editorial notes provide concise introductions to each topic, occasionally drawing attention to political sensitivities and the need for a ‘critical eye’. So this cannabis reader has a value both as a shortcut to researchers entering the area and a synthesis for experts.

You will find a wide range of views expressed in the chapters in this monograph, not all of them in agreement. The arguments, tone and conclusion of each chapter is the responsibility of the author alone, and is not necessarily endorsed or supported by the EMCDDA. This reflects the wider discourse on cannabis where different positions and perspectives often lead to different conclusions being drawn from the same evidence. We believe each chapter represents a useful contribution to the overall debate, even if their individual perspectives differ.

## Two volumes, multiple audiences: policymakers, enforcers, researchers, professionals

The monograph is divided into two volumes, each comprising three sections. There are a number of reasons for the two-volume approach. While complementary, each has a slightly different audience. The first volume centres on political, legislative, commercial and social developments relating to cannabis. Its core audience thus comprises policymakers, sociologists, historians, journalists and those involved in enforcement. The second volume is very much centred on drugs professionals working in the fields of treatment, prevention and healthcare.

### Volume 1

- Cannabis in the past
- Policies, legislation and control strategies
- Supply and production issues

### Volume 2

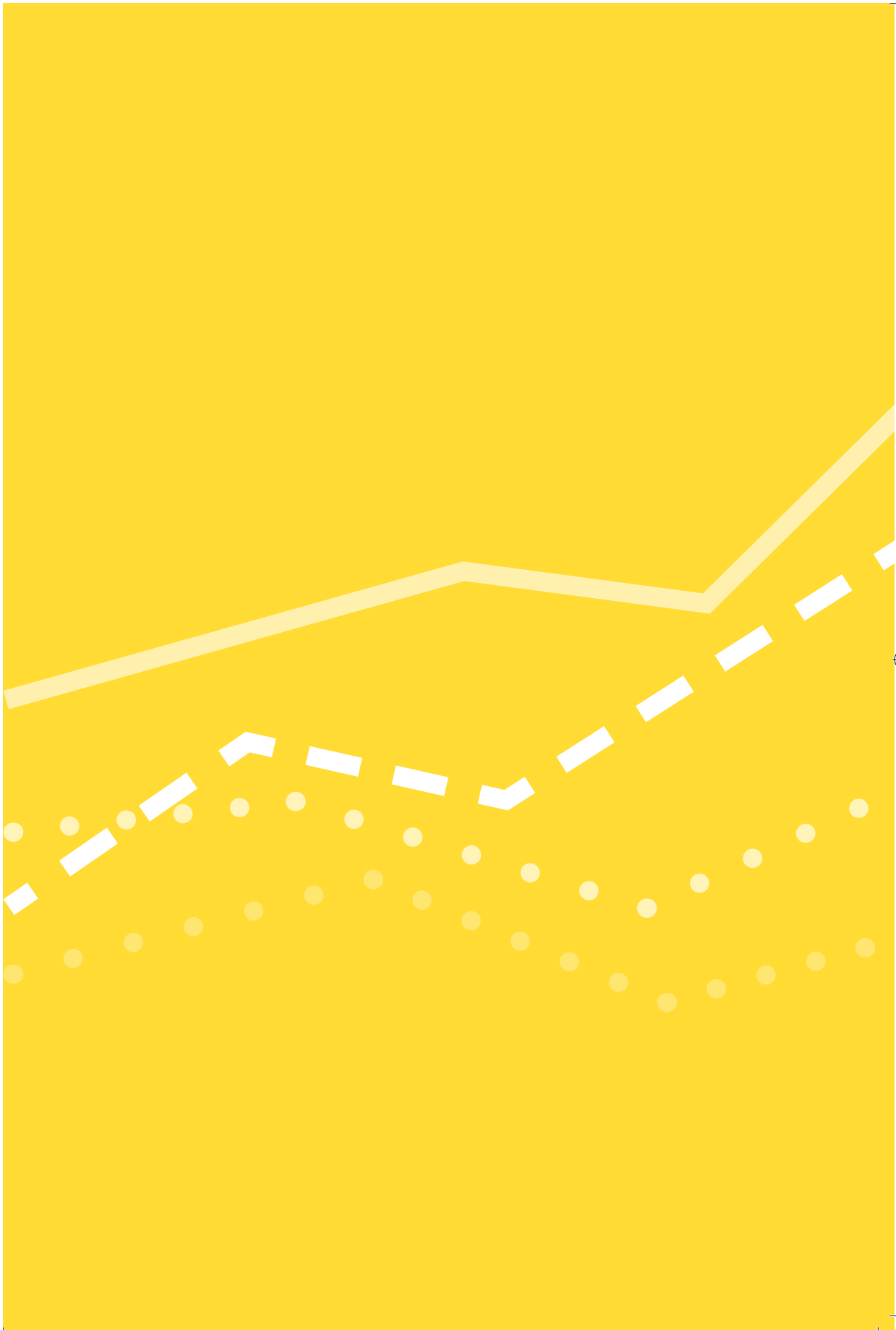
- Epidemiology
- Health effects of cannabis use
- Prevention and treatment

## Changing perspectives: from global issues to local experiences

What unites both volumes is an attempt to fuse general chapters with specific case studies. Within each section, you will encounter a progression from a 'top level' to a 'close-up' view of the subject. So each section begins with chapters providing a general introduction to a single cannabis issue, often of an encyclopaedic nature, together with a summary of the current state of scientific research. The monograph then 'zooms in' with a case study about a specific aspect of cannabis.

### In Volume 2 ...

In Volume 2 we can read general overviews of impact of cannabis use on health, from an individual perspective (the Witton chapter) and public health perspective (the Hall and Room chapters); descriptions of current European patterns of cannabis use, from a general population perspective (EMCDDA analysis) and in terms of adolescent use (results from the ESPAD surveys and from Dutch schools); and descriptions of treatment demand for cannabis use disorders in Europe. Case study articles look at the way cannabis users perceive their use in Finland, the specific effects of cannabis use on driving and the rise in cannabis treatment demand in Germany.







## Foreword

The first volume of the EMCDDA's cannabis reader reviewed the history of the drug and its social impact, and also explored legislative issues. In this second volume, the focus moves to describing contemporary patterns of use, reviewing what is known about the potential health effects of the drug and highlighting how Europe is responding to cannabis use in terms of prevention and treatment.

The cannabis reader would not have been possible without the input of many European and international experts and the EMCDDA is indebted to all the scientists and researchers who have contributed original papers to this publication. We would also especially acknowledge the excellent work carried out by the Centre for Social Research on Alcohol and Drugs (SoRAD) in Sweden, which was the main contractor on this project. We also thank the reviewers from the EMCDDA's Scientific Committee, and John Witton and Wendy Swift, independent scientific editors.

### Epidemiology, and the need to focus on 'at-risk' populations

The epidemiology of illicit drug use has seen marked improvements in the last two decades, with standard indicators having been set up and more reliable surveying methods introduced in many European countries. However, while surveys now allow us to chart the changing prevalence of cannabis use, they currently remain a weak vehicle for identifying those who may be using the drug intensively or experiencing problems. Measuring problematic cannabis use at the population level is methodologically challenging, but progress is being made.

This volume includes a chapter on screening instruments for identifying cannabis use problems, together with a Dutch schools study, which explores how cannabis use can be part of a broader pattern of polydrug consumption.

Cannabis consumption in the European population, particularly among adolescents and young adults, has been increasing since the 1960s. The most recent EMCDDA figures estimate that 13 million of the nearly 500 million Europeans in the EU Member States have consumed cannabis in the past month. Yet despite its being the most commonly consumed drug, cannabis use is far from 'standard behaviour'. The number of people who have not smoked cannabis in Europe in the last month is clearly far higher than the number of those who have, by a factor of around 40 to 1. Cannabis is a drug associated with the young. Yet even in high-prevalence countries, among those aged between 15 and 34 years, at most only one in five are estimated to have used cannabis



## Foreword

in the past month. And a more typical representative estimate across Europe is that only one in eight young people have smoked cannabis in the last month, whilst in the lower prevalence countries such as Greece, Bulgaria and Sweden, as few as 1 in 20 young people report last-month use of the drug.

Moreover, much cannabis use can be described as experimental behaviour which does not result in regular consumption patterns becoming established. Some surveys have sought to identify intensive use, defined as 'daily' or 'near-daily' use. Among the EU Member States for which data are available, the proportion of last-month cannabis users reporting daily or near-daily use ranges from 1 in 20 (Latvia) to 1 in 3 (Spain). Other reporting countries state that around one-quarter to one-fifth of last-month cannabis users report 'daily or near-daily use'. While data are insufficient to indicate an accurate estimate of intensive cannabis users across Europe, a rough figure would place the number of daily or near-daily cannabis users in Europe at around 3 million.

Most last-month cannabis users are young, with males generally more likely to have used cannabis in the last month. Data from the ESPAD series of school surveys provides us with an interesting window on consumption patterns among 15–16 year olds. Among this group, young males are generally more likely to have used cannabis on a frequent basis (defined as having used cannabis on 40 or more occasions). Reported frequent use by male students is twice, three times or even, in one country, four times higher than among female students.

Even among those who establish regular cannabis use patterns in their youth, many will stop using the drug as they grow older. Cannabis prevalence rates tend to peak among younger adults (aged 15–24 years), suggesting that the majority of cannabis users quit as they get older and assume more responsibilities. However, whilst most cannabis users will have stopped consuming the substance by their mid- to late 30s, there is some evidence to suggest that more people are now continuing to smoke the drug into middle age. If this is true, it could have important implications for assessing the likely longer-term public health impact of cannabis consumption.

More positively, recent studies suggest that in many high-prevalence countries, cannabis use is now showing signs of a stabilisation, or even a moderate decrease. Interestingly, this finding may be particularly evident in younger age cohorts. Nonetheless, cannabis use in Europe remains at a historically high level, and it remains unclear if we are seeing any stabilisation or fall in the numbers of those using the drug intensively and chronically — a group who are likely to be at particular risk of experiencing adverse consequences.





## Cannabis and health

Historically, the cannabis health debate has often appeared poorly grounded in science with the possible adverse health effects of use being either trivialised or exaggerated. In this volume, a number of commentaries address cannabis and health issues. This is an area of emerging science where the evidence base is developing rapidly. A clear message emerges from this discourse: when discussing the health impact of cannabis use, it is vital to understand that different consumption patterns are likely to be associated with different risk profiles, and that risks may vary according to individual susceptibilities.

Cannabis has been associated with a number of adverse physical and psychological health effects, especially if used regularly. Recently, considerable concern has been expressed regarding cannabis's relationship with mental health problems, including a possible association with schizophrenia. Studies on the physical effects of cannabis use have also appeared regularly in the research literature. Amongst others, they have examined cannabis and respiratory problems, potential genetic vulnerabilities linked to cannabis-related problems, the effects of cannabinoids on the body's endocannabinoid system and cannabis's potential to impair driving skills.

A chapter in this volume by John Witton summarises the predominant recent studies of cannabis's adverse health effects. An appendix also offers a guide to help students to navigate the research base, with advice on how to approach the many claims made for and against cannabis use with a critical eye. Witton's chapter argues that, although cannabis use has been linked to psychological problems, and an association clearly exists between cannabis use and some forms of mental illness, determining with certainty a direct causal relationship still remains a more difficult question.

Although few people today regard cannabis as a harm-free substance, there is debate as to the relative public health impact of the substance, particularly in comparison with tobacco, alcohol and other illicit drugs. This volume of the monograph includes analysis by Wayne Hall and Robin Room of the global burden of cannabis use disorders in comparison with other drugs. While cannabis appears to have lower intrinsic risks than drugs such as heroin and other opiates — for example in terms of overdose risk, degree of intoxication and risk of dependence — cannabis use is far more widespread than the use of other illicit drugs, and so relatively low risks at the individual level can still result in a significant problem for public health at the population level.

Beyond the direct risk that cannabis use may pose to health, a number of broader public health issues exist. Among these are the secondary health risks posed by the drug, for



## Foreword

example the extent to which the drug is associated with road traffic accidents. Some work has been done in this area, particularly with respect to cannabis use and driving. This topic is reviewed here in a chapter that suggests that a minority of cannabis users drive under the influence of cannabis, with an adverse effect on road safety.

Although reports of drug treatment attendance by cannabis users have been growing, it is difficult to interpret what this means regarding the extent to which users experience difficulties. There are a number of reasons for this, including the fact that this data reflects both direct referrals from criminal justice and other agencies, as well as individuals spontaneously seeking help. Additionally, treatment services specifically targeted to cannabis users are still relatively rare in Europe. This may be beginning to change, but it is still worth noting that few evaluation studies of the efficacy of different cannabis treatment approaches have been carried out. More research is necessary to identify the best practices in this area. At the current time, no 'gold standard' exists for treating cannabis-related disorders, although structured psychosocial interventions appear to offer some promise in this area.

## Prevention: a shift towards standard programmes and measuring effectiveness

In the field of prevention, considerable progress has been made in identifying factors which may influence cannabis use (age of initiation, peer influence, risk perception) and organisation of prevention intervention (universal, selective, indicated prevention). A number of countries have standardised prevention practice in schools by introducing manuals, although there is considerable variation in prevention programmes across Europe. Some evaluation of outcomes of specific prevention projects (e.g. EU-Dap) has showed that prevention, according to the predefined objectives, can contribute to a decrease in cannabis use. However, little is still known about the cost-effectiveness of interventions in this area. Moreover, the evidence base for some specific types of intervention, in particular mass media campaigns, remains weak.

## The cannabis reader ... one more addition to a growing evidence base

Drawing the various strands of cannabis in Europe together, this monograph demonstrates that cannabis is a complex subject, in which we see considerable changes over time. The dynamic nature of this topic is evident not just in developments in the way the drug is used but also in attitudes, legislation and societal responses. Our understanding of this complex phenomenon is, however, growing and new material of all types is becoming ever more available.







There may be cause for muted optimism. Prevention practice is increasingly responding to the evidence base for what works. In terms of science, the workings of the endocannabinoid system are gradually being unravelled, with developments in the medicinal use of cannabis encouraging research scientists to identify the neurological and biological mechanisms that have a bearing on behaviour. In terms of mental health, there is increased understanding of the risk factors that accompany cannabis-associated psychological problems. Perhaps the most positive development is that, increasingly, drug policy in Europe reflects the evidence base drawn from the fields of epidemiology and drug treatment. This evidence base is growing ever stronger, with surveys, medical studies and statistical data all contributing to a sharper, more multidirectional focus on the subject.

The growing volume of new data in this area will naturally need regular review and synthesis. If anything is certain in this field, it is that this will not be the last monograph to be published on cannabis in Europe, nor should it be considered as 'the final word' on this topic. However, it is clear that, in 2008, our understanding of cannabis use in Europe and its probable implications has improved substantially. Cannabis, a substance used in Europe for millennia, still remains worthy of our attention, concern and vigilance.

**Paul Griffiths**

Head of Epidemiology, crime and markets unit, EMCDDA





# Overview of Volume 2

## Part I: Epidemiology

- 1 Prevalence, patterns and trends of cannabis use among adults in Europe  
*Julian Vicente, Deborah Olszewski and João Matias*
- 2 Measuring cannabis-related problems and dependence at the population level  
*François Beck and Stéphane Legleye*
- 3 Patterns of cannabis use among students in Europe  
*Björn Hibell and Barbro Andersson*
- 4 Cannabis in the context of polydrug use: results from the Dutch National School Survey  
*Karin Monshouwer, Filip Smit and Jacqueline Verdurmen*
- 5 Cannabis users and their relation to Finnish society  
*Taru Kekoni*

Historically, the focus for much work in the area of drug epidemiology has been treatment demand data. However, in recent years we have increasingly seen the parallel development of survey data sets, relating both to the general population and selected population groups. This shift in focus has important implications for our understanding of patterns of cannabis use, particularly as in the past the drug has been less associated with problematic patterns of use, while most cannabis users will never come into contact with drug treatment services. In Europe, the EMCDDA has helped coordinate, standardise and collate national drug surveys since it was set up in 1993. Important supranational surveys such as the European School Survey Project on Alcohol and Other Drugs (ESPAD) also offer insight into drug use among adolescents. Monitoring cannabis use trends across countries and over time is now possible in Europe, although methodological differences still exist between countries which mean that data in this area require appropriate technical scrutiny.

The EMCDDA's key indicator on drug use in the general population is represented in this volume in Chapter 1, by Vicente, Olszewski and Matias. The chapter describes cannabis use in the adult population, and the state of play in data collection on cannabis use today. Picking up on one of the conclusions of the EMCDDA chapter — the need for increased knowledge of frequent and intensive patterns of use — the next chapter, by Beck and Legleye, from the French focal point OFDT, provides an overview



of instruments that have been developed to screen populations for intensive cannabis use. These screening instruments vary in length, nature and content, yet some consensus is forming about common ways to measure the incidence of cannabis use disorders, and to identify at-risk populations.

The section proceeds to look at cannabis use among adolescents. Björn Hibell of the ESPAD survey describes cannabis use trends in the school student population, focusing on ESPAD's methodology and its measures of a common age group (15–16 year olds) across Europe. Cannabis use among adolescents is also examined in the following chapter by Monshouwer, who uses data from Dutch school surveys. In particular, this chapter looks at the issue of polydrug use and how cannabis fits alongside alcohol, tobacco and other drug use.

While statistics can tell us much about drug use, there are stories behind numbers and percentages that can provide an additional perspective on this issue. This section ends with a chapter from Finland that uses a qualitative, interview-based approach. Kekoni describes how cannabis users view the substances in terms of their lives, lifestyles and political outlooks. While the chapter makes no claim to be representative of Finnish cannabis users as a whole, it does serve to underline the fact that cannabis use has a social dimension and that the meanings, rationales and experience of cannabis users in different Member States are likely to be important for informing our understating of why consumption patterns differ.

## Part II: Health effects of cannabis use

- 6 Cannabis use and physical and mental health  
*John Witton*
- 7 The public health significance of cannabis in the spectrum of psychoactive substances  
*Robin Room*
- 8 Assessing the population health impact of cannabis use  
*Wayne Hall*
- 9 Cannabis use and driving: implications for public health and transport policy  
*Robert E. Mann, Gina Stoduto, Scott Macdonald and Bruna Brands*



Considerable research effort has been, and continues to be, devoted to the investigation of adverse health effects of cannabis use. Although the current state of research does not provide a clearcut understanding of the issues, some conclusions are beginning to emerge from the current evidence base. This section begins with a chapter by John Witton, summarising what we know about the health effects of cannabis today. He highlights that the issue of the extent of comorbidity of substance-specific and non-substance-specific disorders is crucial when discussing cannabis use, and especially frequent and harmful use.

The topic of health effects to the individual naturally has a bearing on the health of entire populations. The chapter by Room looks at the issue of the public health 'footprint' of cannabis. It provides some insight into the significance of cannabis-related health issues in comparison with tobacco, alcohol and other illicit drugs such as heroin. Room takes on the controversial task of comparing cannabis with other substances, legal as well as illegal. In so doing he provides the reader with a sense of perspective, from which the relative adverse health and social effects of cannabis may be better understood.

In the following chapter, Hall notes that one problem in the debate concerning health effects of cannabis use has been an 'inflationary–deflationary dialectic', in which a demand for unreasonably high standards of proof is often made by both sides of the debate. There are those who argue that there are few or no adverse health effects of cannabis use, and there are those who argue that effects are serious and grave. Hall discusses the problems that arise from conducting research on cannabis use and potential social and health outcomes, and proposes some guidelines for improved research in the future.

Beyond somatic and psychological effects of cannabis, there are other health consequences of cannabis use as it relates to behaviour. One of the areas of cannabis's effect on behaviour that has received strong attention is driving under the influence of cannabis (DUIC). Mann et al. discuss the specific issue of cannabis and driving. The authors have reviewed the scientific literature concerning the effects of cannabis on psychomotor skills, as well as the evidence of the combined effect of alcohol and cannabis on driving skills. They also address the issue of how society might be able to detect and protect itself from cannabis-impaired drivers. As drug-driving tests are being introduced in many European countries, the chapter looks at how countries have sought to quantify the impact of cannabis on road safety.



## Part III: Prevention and treatment

- 10 Treating cannabis use disorders: perspectives and best practices  
*Anders Bergmark*
- 11 Cannabis prevention in the EU  
*Gregor Burkhart*
- 12 Moving towards evidence-based practice: school-based prevention of substance use in the USA  
*Zili Sloboda*
- 13 Cannabis users in drug treatment in Europe: an analysis from treatment demand data  
*Linda Montanari, Colin Taylor and Paul Griffiths*
- 14 Cannabis treatment in Europe: a survey of services  
*Sharon Rödner Sznitman*
- 15 Has treatment demand for cannabis-related disorders increased in Germany?  
*Roland Simon and Ludwig Kraus*
- 16 Risk factors for cannabis use  
*Niall Coggans*

Cannabis prevention and treatment are areas filled with complexity and contradictions. The issue of what constitutes effective treatment remains relatively open in comparison to many other types of drug, and considerable debate exists on whether prevention efforts are effective in this area. Nonetheless, in recent decades a large number of interventions have been developed in Western countries in order to prevent and treat the use of cannabis and other drugs, and the knowledge base in this area is steadily growing.

This section begins with an introduction to cannabis treatment. As the first chapter by Bergmark shows, there is considerable research regarding evidence-based cannabis treatment, yet this does not necessarily mean that the data provide adequate information as to which approach is the most appropriate and effective. For instance, studies do not allow us to determine guidelines for type, duration or intensity of treatment. We also do not know if it is the treatment as such which provides the effect, as it might be the decision to come to treatment in itself that determines the outcome. From this perspective, as Bergmark points out, it is clear that, despite an expanded pool of treatment effect research, the literature does not necessarily provide clearcut answers and guidelines on the issue of best practice in cannabis treatment.





Chapter 11, by Burkhart, provides an overview of prevention relating to cannabis in Europe, categorised according to the typology of universal, selective and indicated prevention. A number of EU Member States have begun to standardise universal school prevention programmes, yet have also placed emphasis on selective prevention linked to risk factor research. Nonetheless, the knowledge base on prevention is based strongly around research in the USA. The third chapter in this section, by Zili Sloboda, an American prevention expert and former Director of the Division of Epidemiology and Prevention Research of the National Institute on Drug Abuse (NIDA), provides an overview of school prevention programmes in the USA, together with some explanation of their rationale.

The section then looks at the issue of the treatment of cannabis use disorders. In recent years, there has been an apparent increase in demand for treatment related to cannabis use. Montanari et al. of the EMCDDA provide an analysis of cannabis treatment demand in Europe, based on data from the EMCDDA treatment demand indicator. The data used are gathered for the purpose of cross-national comparisons, and thereby provide a fruitful starting point for analysing the current situation in Europe. A chapter by Rödner Sznitman then provides an analysis of fresh data gathered in order to reach a better understanding of the current treatment system available to cannabis cases in Europe today. This overview provides relatively up-to-date information about the treatment facilities that see cannabis cases in Europe and what kind of treatment is offered, as well as information about client characteristics. A more in-depth analysis of treatment demand follows in the chapter by Simon and Kraus. This chapter focuses solely on Germany, and analyses what may lie behind the increase in treatment demand related to cannabis use in Germany.

The final chapter looks at risk factors relating to cannabis use. Coggans summarises the literature on the subject of risk factors for cannabis use, and discusses how these might be used to help us target populations at risk. Risk factors are, naturally, important aspects of both prevention and treatment. The chapter thus provides a useful resource for practitioners to understand the needs of their clients, and to target interventions accordingly.

**Peter Thomas**  
EMCDDA

**Sharon Rödner Sznitman**  
Sorad







# Epidemiology





# PART I





# Chapter 1

## Prevalence, patterns and trends of cannabis use among adults in Europe

**Keywords:** adolescent prevalence – adult prevalence – cannabis – epidemiology  
– EMCDDA – EU – longitudinal patterns – survey

### Setting the context

A total of 71 million European adults (22%) have tried cannabis: 23 million European adults (7%) have used it in the last year while 13–14 million European adults (4%) have used the drug in the last 30 days. A crude estimate suggests that 3 million European adults (around 1%) are 'daily' or 'almost daily' cannabis users.

Such headline figures provide neat, newspaper-friendly estimates of the number of cannabis users in Europe. Yet it is important to differentiate between the numbers. There is a vast difference between those who admit having tried cannabis and those whose use appears to be intensive. Beyond this basic distinction there are myriad other variations: growth and decay in perceived risk of use; intensity and setting of use; generational or demographic acceptance and disapproval; country-by-country and region-by-region variation; and ethnicity and gender differences. In short, while cannabis use may be perceived as common in one subgroup, it might be considered outright deviance in another.

Reliable statistics are crucial for defining evidence-based drugs policy. For example, knowing that there is a large difference in lifetime use between 15- to 16-year-olds and 17- to 18-year-olds<sup>(1)</sup> demonstrates that much experimentation with the drug clusters in the late teens. Targeted prevention should, thus, take into account the fact that late-teen initiation is commonplace. Moreover, early indications that use is growing among forty-somethings should be monitored. Middle-age concerns, such as careers, parenthood, rent and mortgages, have traditionally counteracted regular drug use — is something changing today?

(1) <http://stats06.emcdda.europa.eu/en/elements/eyefig01a-en.html>

Information on cannabis use in Europe has improved substantially in recent years, and is subject to a standard reporting cycle. Each year, for over a decade, the EMCDDA has published analysis and information on the prevalence of cannabis and other illicit drugs in its *Annual report*<sup>(2)</sup> (currently covering 29 countries). Since 2004, the *Annual report* has also included a companion publication, the *Statistical bulletin*<sup>(3)</sup>, that provides further information on the underlying data, information sources and methodology. On a less strict yet still frequent cycle — dependent upon implementation of the questionnaire — the ESPAD<sup>(4)</sup> school survey (37 countries) provides a key transnational source for cannabis use patterns among adolescents. Beyond Europe, the standard transnational source for epidemiological data on cannabis is the United Nations Office on Drugs and Crime (UNODC)'s annual *World drugs report*. In addition to this, at a domestic level, many countries publish prevalence surveys in the context of focused national surveys on drugs (e.g. Australia's *National drug strategy household survey* and the SAMHSA *National survey on drug use and health* in the USA).

In addition to these statistical publications, the EMCDDA's National reports<sup>(5)</sup> include discursive analysis of cannabis trends in different European countries. Grey literature (governmental, NGO, think tank) publications on cannabis typically appear several times per year (see the Appendix to Volume 1 of this monograph). Such publications play an important qualitative role, providing explanations for trends and nuanced information at regional level<sup>(6)</sup>.

There remains work to be done. With the EU growing — the recent entry of Bulgaria and Romania having brought the total number of EU citizens close to 500 million — the scope for generalisation is getting smaller. One of the challenges of adding complexity to any sample is that the lists of exceptions grows. There are also possibilities for mining the rich seams of data in the grey literature and ad hoc surveys. As the reporting cycle matures to cover not simply years but decades of data, longitudinal analysis will become possible. For example, it is perhaps premature to speak about generational shifts in cannabis use in 2007.

<sup>(2)</sup> <http://annualreport.emcdda.europa.eu>

<sup>(3)</sup> <http://stats07.emcdda.europa.eu>

<sup>(4)</sup> [www.espad.org/](http://www.espad.org/)

<sup>(5)</sup> [www.emcdda.europa.eu/index.cfm?nNodeID=435](http://www.emcdda.europa.eu/index.cfm?nNodeID=435)

<sup>(6)</sup> See also EMCDDA (2000), *Understanding and responding to drug use: the role of qualitative research*, EMCDDA Monograph Series 4, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.



## Cannabis epidemiology: key websites

Bibliography of European nationwide drug surveys: Table GPS-0

[www.emcdda.europa.eu/stats07/gpstab00/](http://www.emcdda.europa.eu/stats07/gpstab00/)

*EMCDDA Annual report*

<http://annualreport.emcdda.europa.eu>

*EMCDDA Handbook for surveys about drug use among the general population*

<http://www.emcdda.europa.eu/?nnodeid=1380>

*UNODC World drug report*

[www.unodc.org/unodc/world\\_drug\\_report.html](http://www.unodc.org/unodc/world_drug_report.html)



# Prevalence, patterns and trends of cannabis use among adults in Europe

**Julian Vicente, Deborah Olszewski and João Matias**

This chapter presents an overview of prevalence and trends in cannabis use in Europe, based on survey data reported annually to the EMCDDA. This source of information on cannabis use in Europe has improved substantially in recent years. Not only have most countries now conducted national surveys on drug use, but most have also adopted a common set of core items for measuring this behaviour. Methodological differences still exist in the way some surveys are conducted. Nonetheless, overall this information source can now be considered a relatively robust one for commenting on trends and levels of cannabis consumption in Europe.

Cannabis is by far the illegal substance most frequently used in Europe. It is estimated that roughly 71 million people have tried the substance in Europe (about 22% of adult population of 15–64 years), although recent use (last 12 months) or current use (last 30 days) is clearly lower. A rough estimation for Europe indicates 23 million recent users (about 7% of adults) and 13–14 million current users (about 4% of adults), although with marked differences between countries.

Levels of cannabis use are highest among young adults, and this is particularly true when more recent or current use is considered. For example, at the European level, on average among those aged 15–34, last year and last month prevalence is estimated to be 13% and 7% respectively. Use is generally discontinued in later adult life, although it is possible that in future years we will see an increased use of the drug among older people as there is some evidence to suggest that regular use of the drug is becoming more common. Despite increasing concerns about intensive cannabis use, very limited information is available in Europe on the extent of this problem. A rough estimate made by EMCDDA in 2004 suggested that probably around 1% of European adults may be daily cannabis users, and among young adults (15–34 years) estimates range roughly between 1 and 3.5%.

Use of cannabis, as with other illegal drugs, is more common among males, and this is particularly true for measures of more recent or current use. There are marked differences between countries in gender differences, although among young people and school children these differences tend to be smaller. Of the Europeans that have ever tried cannabis, it is estimated that only 18% have used it also in the last 30 days





(current use), although a higher 32% have used it during the last 12 months (recent use).

Cannabis use has increased substantially in most EU countries during the 1990s, in particular among young people. In the new Member States that have more recently joined the European Union, increases have also been generally notable since the mid-1990s. The picture may be beginning to change, however. Although increases are still continuing to some extent, in recent data they are generally less marked and some countries now report a stabilisation or even a decrease in levels of use in the most recent data available.

## Introduction

The increasing levels of cannabis use observed during the last 10 years in most of Europe clearly requires close monitoring as this drug continues to generate considerable public and policy interest. While there is recent evidence that cannabis use may be decreasing in some high-prevalence countries, such as the United Kingdom and Spain, it remains an important topic. Monitoring patterns of cannabis use, especially the intensive and sustained use of the drug, has also become more important as concerns have grown about the possible longer-term health and social consequences of use. Overall, in Europe the information available on the use of this drug varies considerably and there is generally an absence of data on more intensive patterns of use — which may be most important for considering the implications of cannabis use for public health (see Beck and Legleye, this monograph). A comprehensive review of the European data can therefore provide a more robust platform for facilitating a debate on cannabis and identifying information needs. This chapter offers a basic descriptive overview of cannabis prevalence in the different EU countries. In addition, crude European averages have been computed for basic patterns of cannabis use: lifetime experience, last year prevalence, last month prevalence and, with more difficulties, more intensive forms of use such as daily use. The method to estimate these European figures has been relatively simple (weighted averages) and results should be taken as a first but informative approximation, which will require improvement in the future as further data become available.

## Measuring cannabis use in the population

Cannabis use in the general population can be measured through representative surveys among adults and school children, which provide estimations of the proportion of the population having used drugs during standard timeframes: any use in the lifetime (also sometimes referred to as 'experimentation'), any use in the previous 12 months (also sometimes referred to as 'recent use') and any use in the previous 30 days (also referred



to as 'current use'). Although response and non-reporting biases can have an impact on any survey exercise, population surveys — if well conducted — are generally considered to produce reasonable estimations of cannabis use. This is particularly true of cannabis use: compared with other drugs, cannabis smoking is a relatively less stigmatised behaviour, and it is also more common than use of other drugs.

'Lifetime use' as a measure has limited value in describing current levels of drug use, although it may be useful for exploring broader questions, for example, the difference between users and non-users in attitudes and perceptions, or charting cannabis over time to analyse 'use careers'. Use in the previous 12 months and the previous 30 days give better indicators of actual drug use. The latter can be used to indicate regularity of use, although clearly this is an imperfect measure in this respect.

Information presented here is based on national surveys among adults<sup>(7)</sup>, but the reader should note that school surveys are addressed in detail elsewhere in this monograph. Analysis is presented here that is predominantly based on surveys conducted by EU Member States, between 2003 and 2006<sup>(8)</sup>. The results of these surveys are reported annually by Member States to the EMCDDA through a standardised form. Detailed information on those datasets included here can be found in the EMCDDA annual reports and the accompanying *Statistical Bulletin*.

The EMCDDA has developed guidelines for surveys that include a set of common core items ('European Model Questionnaire' (EMQ))<sup>(9)</sup>. These questions are now used in most adult surveys conducted in the EU Member States. Although, overall, the quality, reliability and comparability of European survey data have improved considerably, some methodological differences still exist between countries in the way surveys are conducted. This means that caution is still required in interpreting differences, especially where they are small.

In this chapter we will restrict our attention to the issue of prevalence. However, it is worth noting that survey work in Europe is increasingly addressing a wider set of questions in this area. Among these are: the identification of risk and protective factors for initiation of cannabis use or for progression to more intensive forms of use (see Coggans, this monograph); and the assessment of levels of problems and dependence found with different patterns of use. Readers interested in these issues are directed to recent reviews by Hall et al. (2001), INSERM (2001), Rodin Foundation (2002) and Simon (2004).

<sup>(7)</sup> The term 'adults' is used in this paper to refer to the group of 16–64 years of age. Most surveys target this population, although the reporting may address other specific subgroups selected by age.

<sup>(8)</sup> Malta 2001, Portugal 2001 — new survey conducted in 2007 — and Poland 2002.

<sup>(9)</sup> See EMCDDA (2002), *Handbook for surveys about drug use among the general population*: [www.emcdda.eu.int/?nnodeid=1380](http://www.emcdda.eu.int/?nnodeid=1380)





## Prevalence of cannabis use in Europe

### Lifetime prevalence (ever use)

Cannabis is by far the most commonly used illegal substance in Europe<sup>(10)</sup>. Recent surveys indicate that between 2 and 37% of adults (15–64 years) have tried the substance at least once. The lowest lifetime prevalence estimates were found in Romania (1.7%), Malta (3.5%) and Bulgaria (4.4%) and the highest in the United Kingdom (29.8%), France (30.6%) and Denmark (36.5%). In most countries (12 of the 26 countries from which information was available) lifetime prevalence was estimated to be between 10 and 25% of the adult population.

A crude estimation, computed as an average from national prevalence data and weighted to reflect population size, suggests that over 70 million adults (15–64 years) have tried cannabis in Europe as a whole, representing about 22% of the adult population. Perhaps unsurprisingly, cannabis use is concentrated among young adults (15–34 years), who consistently report higher rates of lifetime use than the population average. Between 3 and 49.5% of young Europeans report having tried the drug, with the lowest prevalence estimates found in Romania, Malta and Bulgaria and the highest in Denmark (49.5%), France (43.6%) and the United Kingdom (41.5%). In general, the prevalence levels are found to be greatest among young people aged 15–24 years, with most countries reporting that somewhere in the range of 20–40% of this age group have tried the drug at least once.

### Last 12 months prevalence ('last year', recent use)

Overall in the EU, an estimated one-third (32%) of people who have ever tried cannabis have also used it in the last 12 months. Put another way, around two-thirds of those who have ever used cannabis have not done so in the last year. Interestingly, among those who have used cannabis in the last year, about 60% have also done so in the last month, suggesting some regularity of use.

Depending on the country surveyed, between 1 and 11.2% of adults report having used cannabis in the last 12 months, with Malta, Bulgaria and Greece presenting the lowest prevalence estimates and Italy (11.2%), Spain (11.2%), the Czech Republic (9.3%) and the United Kingdom (8.7%) the highest. Most countries (13 out of 25) reported figures in the range of 4–9%.

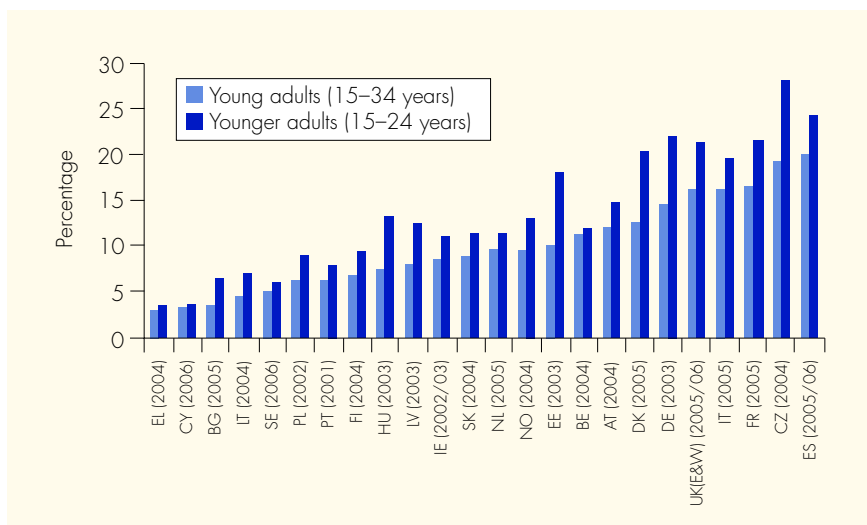
<sup>(10)</sup> Estimates for the EU presented in this paper relate to the European Member States and Norway, which participates in EMCDDA activities by special agreement.

A crude estimate would suggest that over 23 million adults, around 7%, have used cannabis in the last 12 months in the European Union as a whole. Most of those who had used the drug in the previous 12 months were young, with 18 of the 23 million estimated users falling into the age range of 15–34 years. In other words, about 13% of all those aged 15–34 had used the drug, a rate nearly five times higher than that found among those aged 35–64 years, among whom, at the European level, last year prevalence is estimated to be about 2.5%.

European averages are naturally most influenced by patterns of use in the countries with larger populations. They can therefore obscure heterogeneity at the Member State level. Depending on the country surveyed, between 2 and 20% of young adults (15–34 years) report having used cannabis, with the lowest figures found in Malta, Greece, Cyprus and Bulgaria, and the highest in Spain (20.3%), the Czech Republic (19.3%), France (16.7%) and Italy (16.5%). Overall, 11 countries reported prevalence estimates for this age group in the range of 7–15%.

If attention is restricted to young adults, last year prevalence rates rise considerably. Among Europeans aged 15–24 years, estimates of use in the last year range from 4 to 28%, with most countries falling between 10 and 25%. This means that, depending on the country, somewhere between 1 in 10 and 1 in 4 young Europeans have used cannabis in the previous year, with the figure rising to nearly one out of every two males between 15 and 24 in some countries (Figure 1).

**Figure 1:** Recent use (last 12 months) of cannabis among young adults (15–34 years old) and very young adults (15–24 years old) in EU Member States

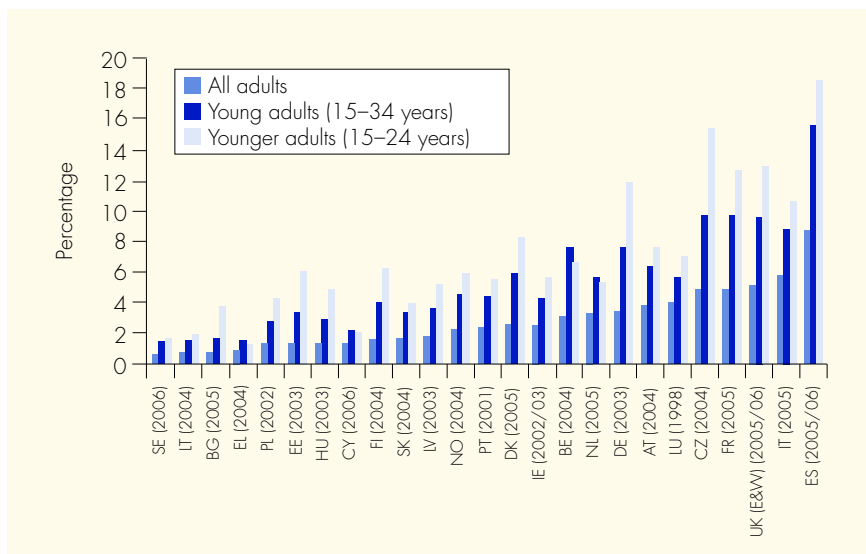


### Last 30 days prevalence (current use)

In recent European surveys, current use (last month prevalence) was reported somewhere between 0.5 and 8.7% of all adults. The highest figures were found in Spain (8.7%), Italy (5.8%) and the United Kingdom (5.2%) and the lowest in Malta, Sweden and Lithuania. Thirteen out of 26 countries for which information was available reported figures in the range 2–6%. These data can be used to produce an EU population estimate that around 13.5 million adults (aged 15–64 years) have used cannabis in the last 30 days, representing nearly 4% of all adults. This figure should be considered as a minimum estimate. The majority of those who had used in the last month were young, with about 10 million out of the total 13.5 million falling in the 16–34 years age group, suggesting that around 7% of young adult Europeans can be considered current cannabis users. These figures vary considerably depending on the country, from less than 2% (1.5%) to over 15%, with the highest figures in Spain (15.5%) and France (9.8%). Sixteen out of 25 countries for which information was available reported figures in the range of 3–10%. By restricting the analysis to an even younger age group (15–24 years), even higher levels of last month use were generally reported. For this age cohort, last month prevalence varied between 1.2 and 18.6%, with most countries typically falling in a range of between 5 and 10%.

‘Use in the last 30 days’ can be taken as an indicator of ‘current use’ and will include people who use cannabis regularly, although clearly not all will fall into this category.

**Figure 2:** Current use (last 30 days) of cannabis among all adults (15–64 years old), among young adults (15–34 years old) and among 15- to 24-year-olds, in the EU Member States





It is also unclear what proportion of those reporting use in the last month will be consuming the drug on a daily or near-daily basis. A clue is provided by a recent estimate conducted by the EMCDDA, based on more detailed analysis of data available from seven countries. In this exercise, it was found that between 19 and 33% of those reporting use in the last 30 days were daily or near-daily users (EMCDDA, 2004a) (Figure 2). As those using cannabis on a regular and intensive basis are an important group for developing a better understanding of the public health impact of cannabis consumption, improving the information available on this kind of consumption pattern is, therefore, an important task for the future (see Beck and Legleye, this monograph).

## Comparing figures from Europe and other parts of the world

When considering cannabis consumption in Europe, one question that often arises is how it compares with patterns of use elsewhere. Cannabis consumption is estimated to be common in both parts of Africa and Asia, but data to allow meaningful comparisons with European patterns are not available. A contrasting point of reference can be found in data from the USA, Canada and Australia, all of which have undertaken surveys of cannabis use that are broadly similar to European studies. In 2005, the US national household survey on drugs<sup>(11)</sup> reported that 40.1% of adults (12 years and older) reported lifetime use of cannabis. This can be compared with an EU average of about 22%. Even taking into account the slightly different age range covered, the US figure is clearly higher than the European average, although some European countries come close. For example, both Denmark and the United Kingdom report lifetime prevalence estimates slightly in excess of 30%.

To some extent, differences in lifetime prevalence between America and Europe can be seen to reflect a historically earlier — that is, generational — experience with widespread drug use. This is illustrated by looking at last year prevalence estimates, which are more similar, at 10.4% and 7% respectively, with a number of European countries (Italy, Spain and the Czech Republic) reporting similar figures that approach the higher US estimate. Further points of comparison are provided by Canadian data (2004)<sup>(12)</sup>, with lifetime adult prevalence (defined as 15 years and above) being estimated at 44.5% and last year prevalence at 14.1%, higher than the figures for

<sup>(11)</sup> Source: SAMHSA, Office of Applied Studies, National Survey on Drug use and Health, 2005 — see [www.samhsa.gov](http://www.samhsa.gov) and <http://oas.samhsa.gov/nhsda.htm#NHSDAinfo>. Note that the age range for 'all adults' in the US survey ('12 years and over') is wider than the age standard range for European surveys (15–64), implying that these will present relatively higher figures.

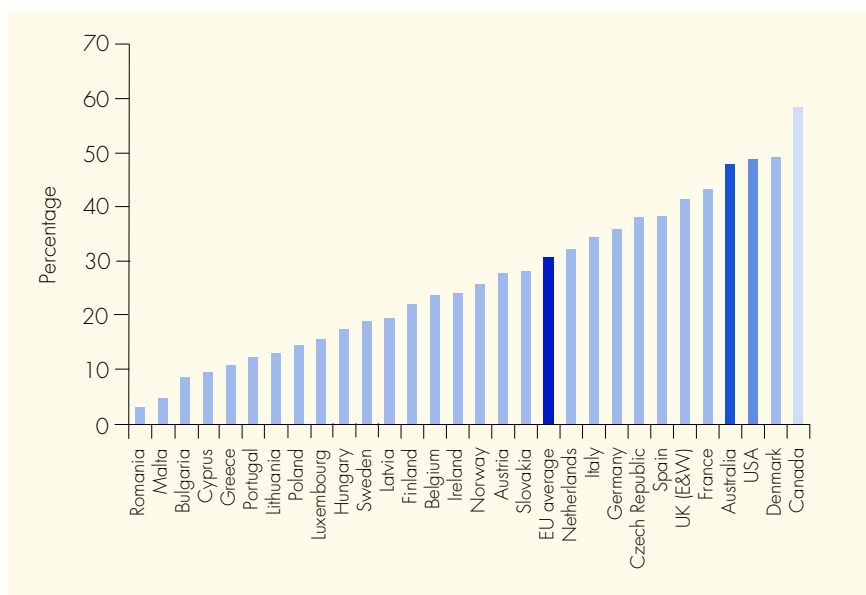
<sup>(12)</sup> Source: Adlaf, E.M., Begin, P. and Sawka, E. (eds) (2005), *Canadian Addiction Survey (CAS): A national survey of Canadians' use of alcohol and other drugs — prevalence of use and related harms, detailed report*. Canadian Centre on Substance Abuse, Ottawa. Note that the age range for 'all adults' in the Canadian survey ('15 years and over') is wider than the age standard range for European surveys. See Note 4.



both Europe and the USA. Similarly, Australian data (2004) <sup>(13)</sup> suggest that one-third (33.6%, or 5.5 million people) of adults (defined as 14 years and older) have ever used cannabis; 11.3% have used cannabis in the last year; and 6.7% are estimated to have used the drug in the last 30 days.

A similar picture is found when prevalence rates among younger adults are compared (Figure 3). In Europe, lifetime prevalence is overall around 30% for the 15–34 years age group. This can be compared with estimates of nearly half (49.1%) of 16- to 34-year-olds in the USA, and a similar figure of 48% for Australians, although the available age breakdown is slightly wider in Australia (14–39 years). In Canada, the estimate for lifetime prevalence among young adults (aged 15–34) is higher still, at 58.6%. For these same age groups, last year prevalence estimates report some divergence: Europe at 13%, the USA at 21.6%, Australia at 20% and Canada at 28.1%. Again, it should be noted that at national level some of the higher-prevalence European countries — the Czech Republic, France, Spain and the United Kingdom — reported estimates that were broadly similar to those found in the USA, Australia and Canada.

**Figure 3:** Lifetime prevalence and previous 12-month prevalence of cannabis use among young adults, in the EU Member States, in the EU as an average and in third countries (USA, Canada, Australia)



Note: In the USA the age range for all adults is 12 years and over.

<sup>(13)</sup> Source: Australian Institute of Health and Welfare, 2005. 2004 National drug strategy household survey: detailed findings. AIHW cat. no. PHE 66. Canberra: AIHW (Drug Statistics Series No. 16). Note that the age range for 'all adults' in the Australian survey ('14 years and over') is wider than the age standard range for European surveys.

## Prevalence of more intensive forms of cannabis use

There is an increasing concern about prevalence of intensive cannabis use and its potential health consequences<sup>(14)</sup>. Unfortunately, very little information is available that might allow some assessment of either levels or trends in this pattern of cannabis use. Where information sources do exist, they are usually difficult to compare across studies. Even the concepts in this area lack standardisation, with different researchers using terms such as 'regular', 'repeated' or 'intensive' use with differing operational definitions. Some population surveys have started to include scales to assess 'problematic use' or 'dependence/abuse', although this work remains very much in its infancy, and harmonisation at the European level is needed (see Beck and Legleye, this monograph).

### Last 30 days use

Given the lack of alternatives, last 30 days cannabis prevalence (current use) could be used as a very rough proxy indicator for estimating regularity of use. However, it should be stressed that this indicator does not imply problematic use or dependence. Information about prevalence of last 30 days use is presented in Figure 4. However, it should be noted that trends over time in this pattern of use are difficult to assess at the European level. Very few countries have data series with more than two measured points, and no clear picture emerges from the data that are available: in many countries no marked changes are observed. In the United Kingdom, a decreasing trend has been observed since 2004, whereas increases of different magnitude are reported in Spain, Belgium, Italy and Finland.

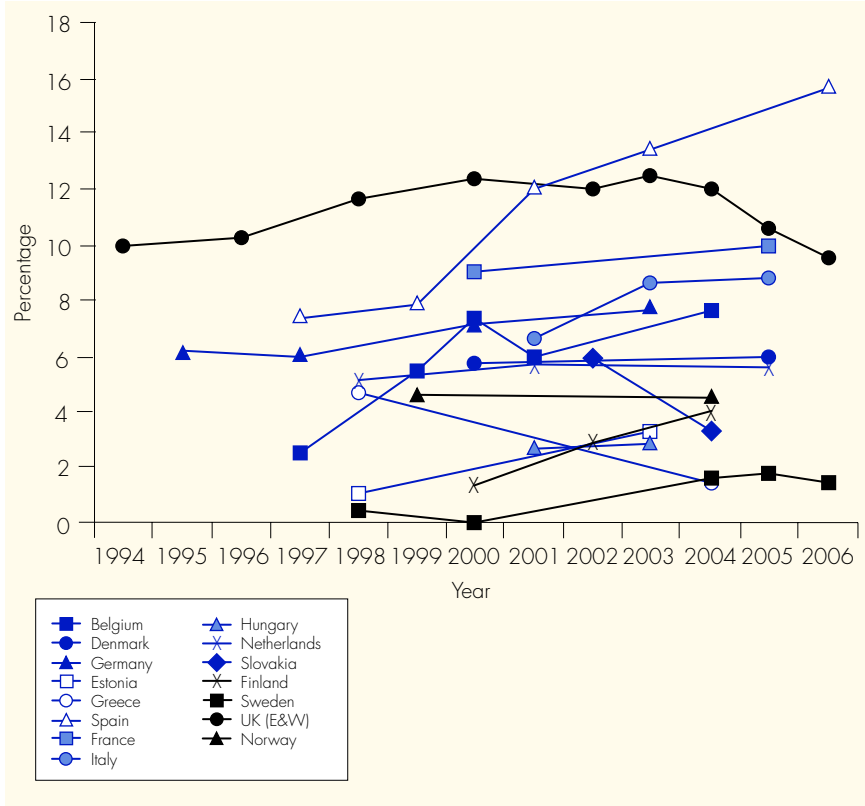
### Daily use of cannabis

'Daily use' or 'almost daily use' (use on 20 days or more during the previous 30 days) may be considered a better indicator of 'intensive use' of cannabis and is included as a topic in a number of different studies and the EMQ. Although it is in need of update, the EMCDDA included an analysis on the available data in this area for the 2004 EMCDDA *Annual report* (EMCDDA, 2004a). Eight countries<sup>(15)</sup> provided data, and, with the exception of Latvia, where the figure was lower (4%), approximately one-quarter (19–33%) of those who had used cannabis in the last 30 days were reported to be daily or near-daily users (Figure 5). In terms of overall prevalence rates, daily use estimates

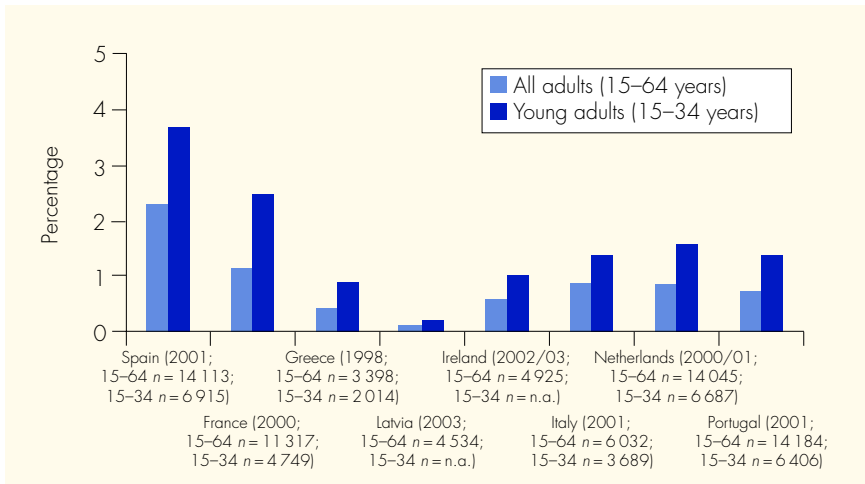
<sup>(14)</sup> For further discussion of the public health effects of cannabis, see chapters by Hall and Room, this monograph, and also dedicated publications by Hall et al. (2001), INSERM (2001), the Rodin Foundation (2002) and Simon (2004).

<sup>(15)</sup> France, Greece, Ireland, Italy, Latvia, the Netherlands, Portugal and Spain. Finland decided not to report due to the small number of last month users in their survey. See more details in 2004 *Annual report* (<http://ar2004.emcdda.europa.eu>).

**Figure 4:** Evolution of current use (last 30 days prevalence) among young adults (15–34 years old) in EU Member States that reported information from consecutive surveys



**Figure 5:** Prevalence of ‘daily or almost daily’ use of cannabis (≥20 days in the last 30 days) in different EU Member States





## Prevalence, patterns and trends of cannabis use among adults in Europe

ranged between 0.5% and 2.3% of all adults (15–64 years) and between 0.9% and 3.7% of young adults (15–34 years). Extrapolation of these data would give a rough estimation that there may be around 3 million daily cannabis users in the EU, or about 1% of the adult population.

Almost all daily users concentrate in the age range 15–34 years, and the vast majority are male. At present, it is difficult to assess trends in daily use, as information reported here was based on an ad hoc data collection exercise. However, this exercise is currently being repeated. Moreover, the data currently available are simply a behavioural measure of drug use. No supplementary information is available that allows informed comment on the extent to which daily users are likely to be experiencing problems or dependence. It would, nonetheless, be reasonable to assume that daily use would be associated with both. A study conducted in 1992 in the USA (Kandel and Davis, 1992) reported that one in three daily users met DSM-III criteria for dependence. The extent to which this estimate is likely to be valid for patterns of cannabis use in Europe today is unclear.

### Estimations of cannabis dependence or problematic use

Frequency of use is relatively easy to measure in questionnaires, although additional information on dependence or problems would add insight into the implications and correlates of substance use. Despite the difficulties, it can be argued that surveys have the potential to better estimate cannabis use disorders. At present, there is limited information on prevalence of cannabis dependence or problematic use in Europe. A recent review of surveys carried out in European countries from 1990 until 2002 found that 0.3–2.9% of adults met the criteria for ‘drug dependence’ (including all illicit drugs) in the previous 12 months, and in addition similar or higher numbers were classified as using the drug in a manner that could be defined as ‘abuse/harmful use’. The highest estimates were found among young people aged 18–25 years (Rehm et al., 2005).

Figures from the US survey may provide a useful point of reference, although they cannot be assumed to translate directly to the European situation. In the 2003 National Survey on Drug Use and Health (SAMHSA, 2004a) 1.8% of people aged 12 or over fulfilled DSM-IV criteria for cannabis dependence or abuse during the previous year, or around 4.2 million Americans. The proportion among 18- to 25-year-olds was higher, at 5.9%. Data from this survey suggested that 16.6% of those who had used cannabis in the last year met the criteria for either dependence or abuse of the substance.

### Patterns of use: continuation rates of cannabis use

In general, cannabis use tends to be occasional or discontinued some time after its initiation in adolescence or during a user’s early 20s. Thus, prevalence rates become

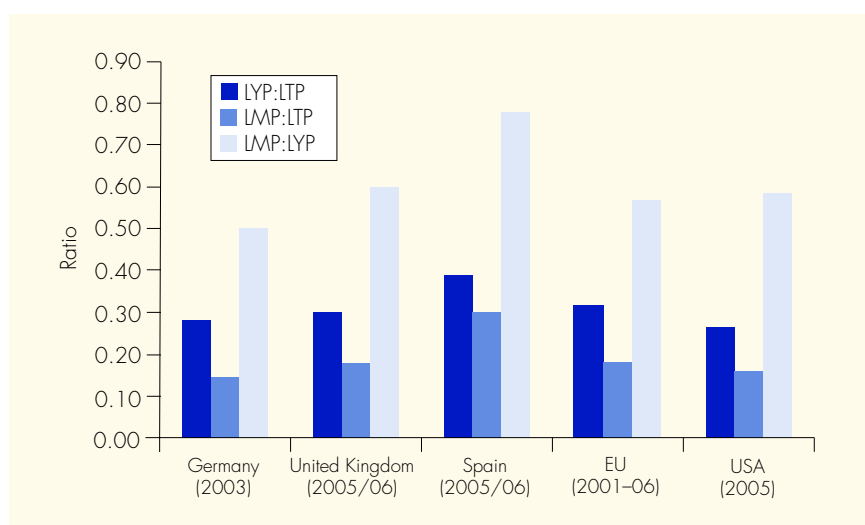




lower with increasing age, in particular for measures of last year or last month use. 'Continuation rates' can be considered as the proportion of people that, having used a drug for a longer period of time (e.g. during their lifetime), have also used it in a more recent period (e.g. during the last 12 months or last 30 days). As a European average, only 18% of those that have ever tried cannabis have used it also in the last 30 days (Figure 6). National figures range from 10% or less in Denmark, Lithuania, Romania and Sweden to over 20% in Belgium, the Czech Republic, Spain, Italy, Cyprus and Portugal. In addition, on average in Europe, about one-third of those who have ever used the substance have used it in the last 12 months. It is worth noting that, in most countries a relatively high proportion, averaging almost 60%, of those who have used cannabis in the last 12 months have also done so in the last 30 days, suggesting a certain regularity of use, although not necessarily frequent or intensive use. However, there is a wide variation between countries (30–78%).

Continuation rates are relatively stable in those few EU countries where this rate can be computed over a number of years. A similar finding is observed in the USA. This may suggest that there is not an intensification of use patterns among most users, although this may not apply to the more intensive or problematic forms of use. Furthermore, this statement must be made with the caveat that the overall European dataset in which this question can be explored is limited.

**Figure 6:** Continuation rates of cannabis use — European Union average, Germany, Spain and the United Kingdom, and the USA



Note: LMP, last month prevalence; LTP, lifetime prevalence; LYP, last year prevalence.

## Gender differences in cannabis use

In Europe, most young people who have tried an illicit drug have used cannabis, and males are generally more likely to have done so than females. Adult and school survey data suggest that there has been only limited convergence in cannabis use between males and females, and increases in cannabis use have tended to occur largely in parallel. Some patterns are, nonetheless, detectable. For example, female and male use tends to become more equal as prevalence of cannabis use increases, and this gender gap is generally wider for use of other illegal drugs and for recent or frequent patterns of drug use.

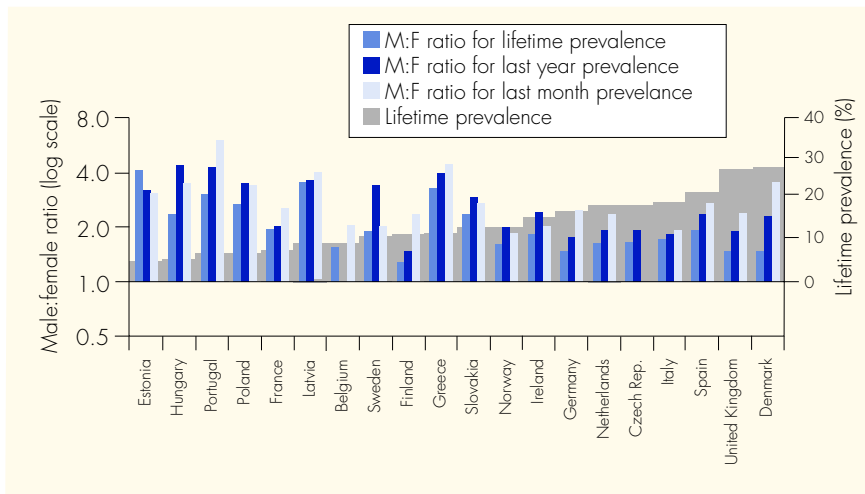
Male to female ratios<sup>(16)</sup> tend to be consistently higher among surveys of adults than among school students. Among students aged 15–16 years, lifetime experience of cannabis is slightly higher among males in all but three countries (Ireland, Finland and Norway). School student male/female differences are fairly consistent and small across most countries in the European Union, ranging from equal ratios in Ireland, Finland and Norway to 1.8 in Portugal. However, among adults (aged 15–64 years) gender differences for lifetime experience of cannabis use reveal a greater gender gap and more variation across countries than among school students: male to female ratios range from 1.25 in Finland to 4.0 in Estonia.

The gender gap also becomes wider if one progresses from lifetime use through recent (last 12 months) to current use (last 30 days) (Figure 7). Recent use (last year prevalence) male–female ratios range from 1.5 in Finland to 4.3 in Hungary. In the case of current use, male–female ratios are even larger, ranging from 1.8 in Norway to 5.9 in Portugal. Among school students, gender ratio differences are considerably greater for ‘frequent use’ of cannabis (defined as ‘used 40+ times during a lifetime’) than for lifetime prevalence or last year prevalence. Nonetheless, some caution is needed in interpreting results for current or frequent use because of the relatively small numbers involved. In European Union countries with relatively high prevalence rates, the difference between male and female adults tends to be less marked than in countries with low prevalence rates. Sweden, Norway and Finland are exceptions, as prevalence is relatively low and male/female differences are minimal.

From 1995 to 2003, although increases generally occurred in parallel among both male and female school students, the trend in countries with relative high prevalence has generally been towards equality between males and females. Among adults, there is

<sup>(16)</sup> Differences between males and females are presented here as ratios of prevalence of use among males over prevalence of use among females. Ratios higher than 1 indicate more males than females; for example, a ratio of 2 indicates twice as many males as females (diagrams are drawn with logarithmic scaling).

**Figure 7: Male:female (M:F) ratios for adults, lifetime prevalence and last month prevalence in Europe**



little evidence of gender convergence in countries with trend data. It is not clear to what extent male predominance at low prevalence levels is determined by persistent cultural factors that make males disproportionately prone to illicit drug experimentation and to what extent it arises from the fact that in many of these countries drug use is a relatively recent historical phenomenon, developing first within the male population. The gender ratios for school students aged 15–16 years reporting that they had drunk five or more drinks in one session during the past 30 days and for lifetime prevalence of cannabis use are broadly similar among different countries (a log scale correlation of 0.46). This may suggest a common association of drug use with an outgoing lifestyle related to gender or age.

## Evolution of cannabis use in Europe — long-term and recent trends

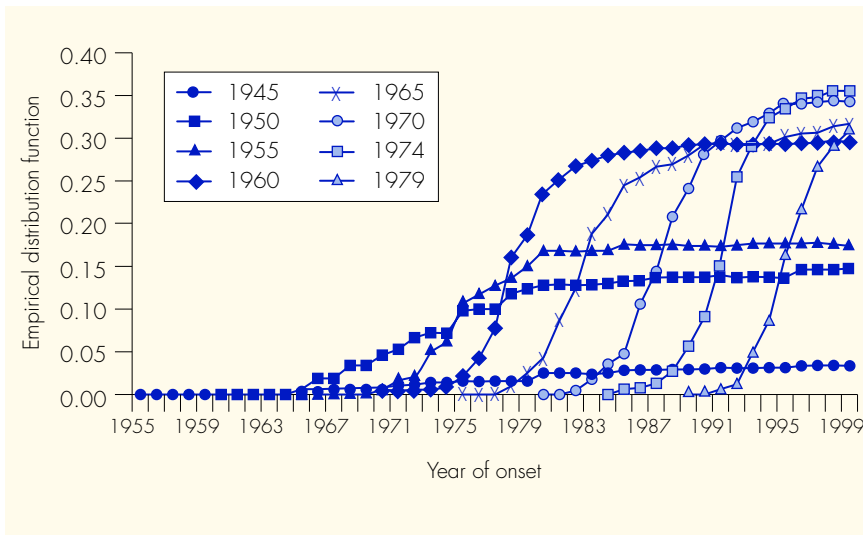
Only a few European countries have a series of drug surveys that allow long-term trends to be identified with any precision. Most countries do not have a set of historical data that can reasonably be considered to represent a time series in any strict sense, although sporadic surveys are sometimes available that give some indication of the historical situation. Moreover, even in those countries where data are the strongest, it is only possible to extend the observational window with any confidence to the early or mid-1990s.

## Initial expansion of cannabis use in European countries

In the USA the widespread expansion of cannabis use began in the first half of the 1960s (Kandel et al., 2001). It is generally considered that this cannabis use began to spread to parts of Europe at this time as part of a growing counterculture (see Olsson and Abrams chapters, this monograph). Where it had become established, the popularity of the drug continued to grow through the 1970s and 1980s. However, both within and between countries there was considerable heterogeneity in levels of use, and the drug was probably more clearly linked with particular subgroups than it is today.

Some indication of patterns of use over time can be gained by looking at the dates given for when a cross-section of cannabis users report their first use of the drug. An analysis on initiation of cannabis use (age of first use) found, for example, that cannabis use expanded markedly in Spain during the 1970s, in the former West Germany during the 1980s and in Greece during the 1990s. In addition, it was observed that the more recent young generations had reported higher levels of cannabis experience than any previous generation in these countries (Kraus and Agustin, 2002). Surveys conducted between 2000 and 2003 indicate significant levels of lifetime experience (12–24%) among the 45- to 54-year-olds in Denmark, France, Germany, the Netherlands, Spain

**Figure 8:** Initiation of cannabis use in Spain according to year and by birth cohort



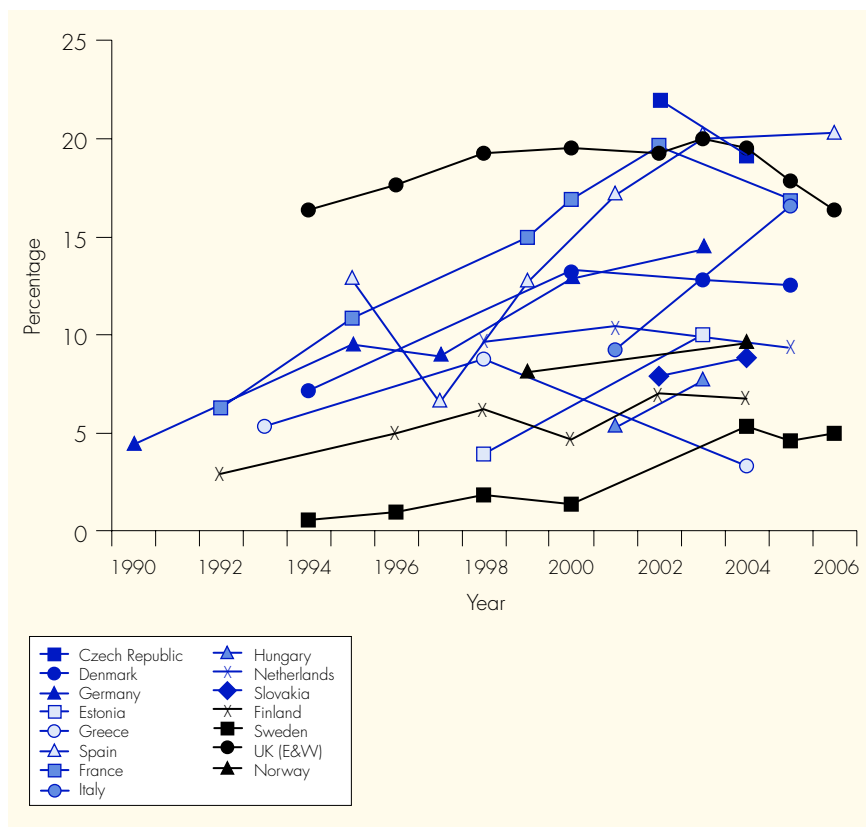
Note: Empirical distribution function for year of onset of cannabis use — Spain, one-year-cohorts. Results from combined surveys of the years 1997 and 1999.

(Figure 8), Sweden and the United Kingdom, suggesting that the number of cannabis users was probably not trivial in these countries 25–30 years ago.

## Recent trends in European countries (1990s to present)

Different types of surveys (national or local household surveys, conscript and school surveys) have shown that cannabis use increased markedly during the 1990s in almost all EU countries, particularly among young people (Hibell et al., 2004; EMCDDA, 2005a) (Figure 9). In most European countries, cannabis use has continued to increase until recent years, although different paces of growth have been observed between countries. Nonetheless, it is worth noting that several countries are reporting a recent stabilisation in levels of use in different settings (EMCDDA, 2005a).

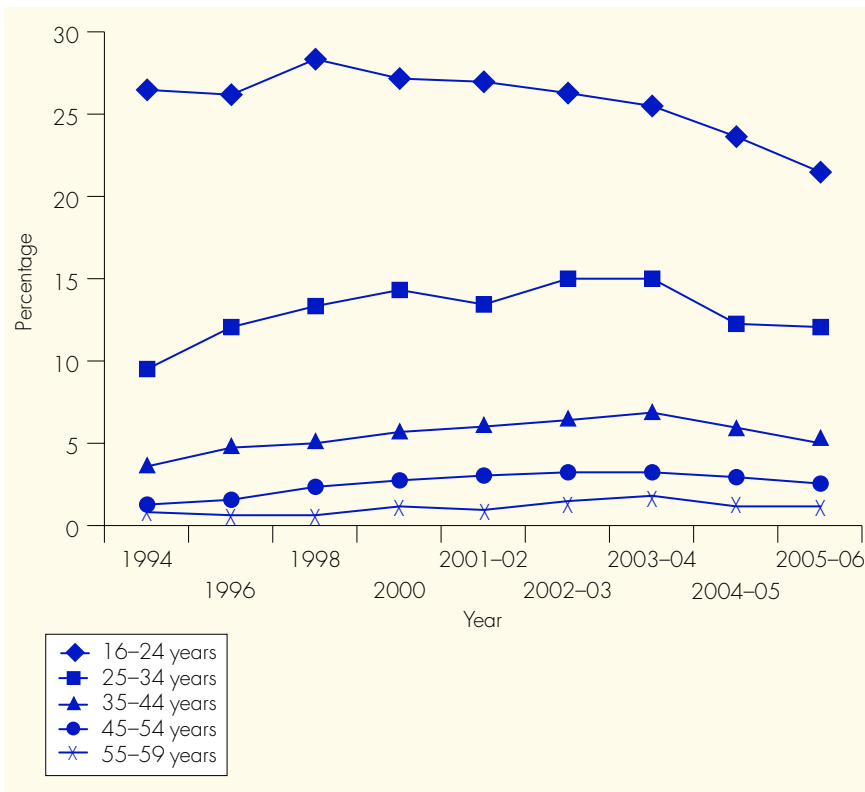
**Figure 9:** Trends in recent use of cannabis (last 12 months) among young adults (15–34 years old)



### Differences by countries

In the United Kingdom (England and Wales) <sup>(17)</sup>, which since the early 1990s has reported among the highest figures in Europe, cannabis use among young adults (16–34 years) remained stable from the mid-1990s until 2003 (19–20%) and then fell between 2003 and 2006 (20–16.3%). It is worth noting that levels of reported use fell more in a time comparison of the age group 16–24 years, while continuing to increase among 25- to 34-year-old males (from 9.4% in 1994 to 14.8% in 2003–2004), although a slight decrease is seen here in the most recent data (12% in 2005–2006). These UK data suggest a ‘generational effect’ in which those who started using the drug 10 or 15 years ago may be more likely to be continuing to use the drug into adulthood, and that the popularity of cannabis may be waning slightly among younger age cohorts (Figure 10).

**Figure 10:** Trends in recent use of cannabis (last 12 months) by age group in the United Kingdom, illustrating a possible ‘generational effect’



<sup>(17)</sup> In this section the information for the United Kingdom is based on British Crime Survey data (for England and Wales). The first BCS (E&W) for which information on drugs is available at the EMCDDA is from 1994.



Prevalence figures among young adults in France, Spain and Italy have reached the levels of the United Kingdom in recent years (2002 or 2003), after a markedly increasing trend for several years. However, some stabilisation is also becoming apparent in these countries. France reported a decrease in 2005, and Spain a clear moderation in the increasing rate in the more recent data (2006). Figures from the Czech Republic (2002) were similar to those from these high-prevalence countries, although more recent information (2004) suggests stabilisation or a slight decrease in prevalence levels.

It is worth noting that, in contrast to the United Kingdom, increases in France and Spain among 15- to 24-year-olds have continued until very recently, with a decrease in France only in its most recent survey. Among 25- to 34-year-olds, a marked increase has been observed in Spain since 1999, with only a slight decrease in 2006. It is, thus, likely that trends among younger people anticipate trends in the broader population, and should therefore be monitored with particular attention.

Denmark and Germany also reported increases in cannabis use until recent years (reaching 12–15% of last 12 months use among young adults), although not reaching the levels of the high-prevalence countries above. The most recent information for these countries indicates stabilisation or small decreases. In the Netherlands, prevalence figures have remained stable, at around 10%, in the period 1998–2005.

Finland and Sweden have presented comparatively low prevalence estimates of cannabis use since the early 1990s. Although some increases have been observed, their figures remain low compared with other countries, without apparent signs of likely convergence with high-prevalence countries. The increase observed in Sweden between 2000 (1.3%) and 2004 (5.3%) may be related to methodological changes. Prevalence estimates for Sweden in the 2004, 2005 and 2006 surveys suggest a stable situation.

Among new Member States, the available information, mainly from school surveys within the ESPAD project (Hibell et al., 2004; EMCDDA, 2004a), suggests that there has been a substantial increase in cannabis use in recent years, in particular since the mid-1990s. Consecutive surveys among adults in Estonia (1998, 4%; 2003, 10%) and Hungary (2001, 5.4%; 2003, 7.7%) have also revealed increases of cannabis use among young adults.

It can be noticed in several new Member States that last 12 months prevalence among 15- to 24-year-olds is in the same range as other EU countries. By contrast, prevalence estimates drop considerably among the immediately older age groups (25–34 or 35–44 years), suggesting a generational effect that could be related to lifestyle changes occurring during political and social changes that took place in these countries during the 1990s, and that were possibly adopted initially by the younger generations (see Moskalewicz et al., this monograph).



Finally, from different sources (adult surveys, youth or conscripts surveys and school surveys, etc.) it can be noted that a number of countries are now reporting recent stabilisation or even a decrease in levels of cannabis use. In some cases, different surveys may signal opposite trends in a country, possibly due to the different age ranges or social milieu covered. Among countries reporting stabilisations are the Czech Republic, Denmark, Germany, France, the Netherlands, Finland, the United Kingdom and Norway. These findings may indicate that the overall increase in cannabis use observed during the 1990s and early 2000s may be starting to stabilise, at least in some countries, and in particular among younger people.

## The present situation and future information needs

Information on prevalence of cannabis use and patterns has increased substantially in recent years in the European Union. Most European Union countries are now conducting harmonised school surveys at regular intervals within the ESPAD project, although sample sizes are sometimes relatively small. Almost all EU countries have conducted general population surveys on drugs, with overall strong compatibility with the EMQ. However, clear limitations still do exist on information at EU level. There are still differences in methodology (e.g. data collection, sampling). Only very few countries have a series of repeated surveys with consistent methodology. Harmonisation beyond the basic items of the EMQ is often limited, including questions that would allow better assessment of more intensive forms of use.

Added value is accrued from surveys if they are repeated over time using comparable methods. It is, therefore, important to consolidate national series of household surveys to generate robust time series. This would greatly increase the analytical value of the data and permit more complex and detailed analyses. There is a need to educate policymakers and those commissioning surveys that this is, by necessity, a long-term investment, with the value of information progressively increasing as survey series become longer.

Data from population surveys form one of the EMCDDA key indicators and there is a political commitment to implementing the indicators in the current EU action plan on drugs. However, although almost all European countries have made progress in this area, there is a clear need to stimulate more regular data collection exercises and a greater adoption of common standards of good practice.

As concern increases about the possible public health implications of cannabis use, it is imperative to improve existing methods and capacity to assess intensive patterns of use, and to analyse their correlates, and potential health and social consequences. This





approach may also need to be extended to embrace other substances (e.g. stimulants, psychoactive medicines, problematic and combined use of alcohol with drugs).

Finally, survey data need to be complemented with longitudinal and more focused studies to describe the specific behaviour of vulnerable subgroups, or to explore important temporal issues, such as drug use initiation and cessation rates. In particular, qualitative studies of users can contribute valuable information that can illuminate the drier statistics. These help to understand the associations found within the statistics, by placing them in the context of an understanding of the individual user's experiences, rationale and motivation.

## Bibliography

- Beck, F., Legleye, S. (2007), 'Measuring cannabis related problems and dependence at the population level', this monograph, Volume 2.
- EMCDDA (2002), *Handbook for surveys on drug use among the general population. Project CT.99. EP.08 B*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2004a), *Annual report 2004*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2004b), *Statistical bulletin 2004*, available at: <http://stats04.emcdda.eu.int/>
- EMCDDA (2005a), *Annual report 2005*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2005b), *Statistical bulletin 2005*, available at: <http://stats05.emcdda.eu.int/>
- Hall, W., Degenhardt, L., Lynskey, M. (2001), *The health and psychological effects of cannabis use*, Monograph Series 44, Commonwealth of Australia, Canberra.
- Hibell, B., Andersson, B., Bjarnasson, T., Ahlström, S., Balakireva, O., Kokkevi, A., Morgan, M. (2004), *The ESPAD report 2003. Alcohol and other drug use among students in 35 European countries*, The European School Survey Project on Alcohol and Other Drugs, CAN, Stockholm.
- INSERM (2001), *Cannabis; quels effets sur le comportement et la santé?*, INSERM (Institut national de la santé et de la recherche médicale), Paris.
- Kandel, D., Davis, M. (1992), 'Progression to regular marijuana involvement: phenomenology and risk factors for near daily use', in Glantz, M., Pickens, R. (eds), *Vulnerability to drug abuse*, American Psychological Association, Washington, 211–253.
- Kandel, D., Griesler, P., Lee, G., Davies, M., Schaffsan, C. (2001), *Parental influence on adolescent marijuana use and the baby boom generation: findings from the 1979–1996 national household survey on drug abuse*, Office of Applied Studies, Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Washington.
- Kraus, L., Agustin, R. (2002), 'Analysis of age of first cannabis use in Germany, Greece and Spain', in EMCDDA, *Technical implementation and update of the EU Databank on national population surveys on drug use and carrying out a joint analysis of data collected. Project CT.00.EP.14*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- Moskalewicz J. et al. (2007), 'Cannabis use in the new Member States', this monograph, Volume 1.
- Rehm, J., Room, R., van den Brink, W., Kraus, L. (2005), 'Problematic drug use and drug use disorders in EU countries and Norway: an overview of the epidemiology', *European Neuropsychopharmacology* 15: 389–397.
- Rodin Foundation (2002), *International scientific conference on cannabis*, Ministry of Public Health of Belgium, Brussels.

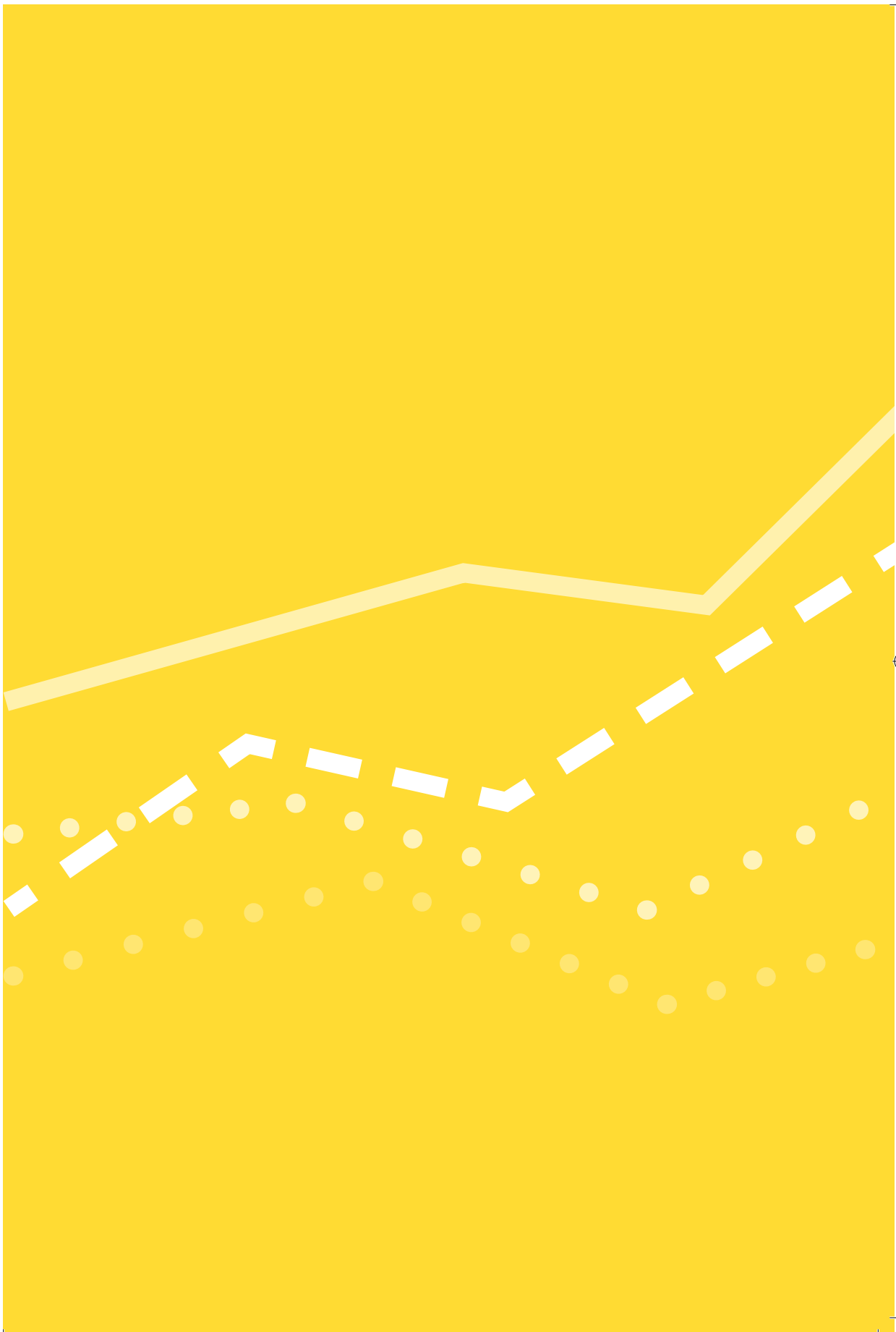


## Prevalence, patterns and trends of cannabis use among adults in Europe

SAMHSA (2004a), *Office of applied studies, national survey on drug use and health, 2003 survey*, Substance Abuse and Mental Health Services Administration, Washington  
<http://oas.samhsa.gov/NHSDA/2k3NSDUH/2k3results.htm#ch7>

SAMHSA (2004b), *Office of applied studies, national survey on drug use and health, 2002 and 2003*, Substance Abuse and Mental Health Services Administration, Washington  
<http://oas.samhsa.gov/nhsda.htm#NHSDAinfo>

Simon, R. (2004), 'Regular and intensive use of cannabis and related problems: conceptual framework and data analysis in the EU Member States', in *Project CT.2003.103.P1*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.







## Chapter 2

# Measuring cannabis-related problems and dependence at the population level

**Keywords:** cannabis – cannabis use – disorders – intensive use – mental health  
– questionnaires – screening – survey design

### Setting the context

While there is evidence of stabilisation or slight decline in use in some high-prevalence countries, cannabis use has, on the whole, increased in most European countries over the last 15 years, especially among adolescents and young adults.

Despite strong public health interest, the commonly used indicators of cannabis use — lifetime and last year prevalence — aim to assess not problematic use but broader use patterns. Indicators of current use — last month prevalence and frequency of use in the past month — provide indirect indications of the extent of more intensive forms of use and problematic use of drugs. Yet frequent use of cannabis does not necessarily imply that users will experience problems, so a more detailed picture is required. As Europe becomes increasingly sensitive to the health risks of cannabis use, particularly among high-prevalence populations, distinguishing between various kinds of use is vital to ensure that interventions are targeted to those most at risk.

Nearly all EU countries now collect information on how many days cannabis has been used in the month prior to interview. However, standardisation remains far from complete: some collect number of days, others number of times smoked or less well-defined measures. The EMCDDA, in collaboration with several national experts, is currently developing the methodological and conceptual framework necessary for monitoring ‘intensive forms of drug use’ to better identify those experiencing problems. Several projects to test psychometric instruments are under way in Germany, France, the Netherlands, Poland, Portugal, the United Kingdom and, most recently, Spain (EMCDDA, 2007).



This chapter, written by experts based at the OFDT (the National focal point for France), presents the main concepts for diagnosing harmful cannabis use, abuse and dependence as well as tolerance and withdrawal symptoms from cannabis. It also touches on wider difficulties in abstaining and controlling use, together with other factors linked to problematic use (family disapproval, financial impacts, etc.). The authors have collected the existing screening tests for cannabis-related disorders. They review the screening processes and comment on their reliability. They then present and discuss the main available cannabis tests and how they may be used in general population surveys. While they suggest that even if the concepts and tools are somewhat arbitrary and vary according to cultural background, such screening instruments remain useful in increasing research into cannabis-related disorders.

## Further reading

- Crocker, L., Algina, J. (1986 [2006]), *Introduction to classical and modern test theory*, Wadsworth Pub. Co., Pacific Grove.
- Decorte, T., Kaminski, D., Muys, M., Slingeneyer, T. (2005), *Problematisch gebruik van (illegale) drugs. Onderzoek naar de operationalisering van het concept in een wettelijke context* [Problematic use of (illegal) drugs: research into operationalising the concept in a legal context], Academia Press, Ghent.
- Decorte, T., Muys, M., Slock, S. (2003), *Cannabis in Vlaanderen: patronen van cannabisgebruik bij ervaren gebruikers* [Cannabis in Flanders: patterns of cannabis consumption in experienced users]; Institute for Social Drug Research, University of Ghent, Acco, Leuven.
- EMCDDA, Annual reports and National reports (released annually in November), European Monitoring Centre for Drugs and Drug Addiction, Lisbon  
[www.emcdda.europa.eu](http://www.emcdda.europa.eu)
- EMCDDA, *Evaluation instruments bank*  
<http://eib.emcdda.europa.eu>
- Macleod, J., Oakes, A., Copello, A., Crome, J., Egger, M., Hickman, M., Oppenkowski, T., Stokes-Lampard, H., Davey Smith, G. (2004), 'The psychological and social sequelae of illicit drug use by young people: systematic review of longitudinal, general population studies', *Pathways to Problems Appendix 2*, UK Home Office  
<http://drugs.homeoffice.gov.uk/publication-search/acmd/pathways-to-problems/Appendix2.pdf>
- Rhem, J., Room, R., Van den Brink, W., Kraus, L. (2005), 'Problematic drug use disorders in EU countries and Norway: an overview of the epidemiology', *European Neuropsychopharmacology* 15(4): 389–397.
- Simon, R. (2003), *Regular and intensive use of cannabis and related problems: conceptual framework and data analysis in the EU Member States*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon  
[www.emcdda.europa.eu/index.cfm?fuseaction=public.AttachmentDownload&nNodeID=5746&languageISO=EN](http://www.emcdda.europa.eu/index.cfm?fuseaction=public.AttachmentDownload&nNodeID=5746&languageISO=EN)



---

# Measuring cannabis-related problems and dependence at the population level

François Beck and Stéphane Legleye

## Introduction

Although common perceptions of the ‘harmlessness’ of cannabis have often been countered in recent years, the fact remains that a majority of cannabis users do not encounter any clinical or social problems. So epidemiologists have sought ways to distinguish — among the many people who report lifetime, last year or last month cannabis use — the profiles of cannabis users who suffer from a cannabis use disorder or who manifest patterns of cannabis use that may require a timely intervention.

The definition of an *acceptable* level of cannabis use, i.e. the establishment of a threshold beyond which the use becomes problematic, is beset with ethical issues. First, cannabis is an illegal drug and so establishing use guidelines may be perceived as condoning its use (see Bennett, this monograph). Second, as with legal drugs such as alcohol or tobacco, problematic use can emerge from what some groups — peers, specific generations and subcultures — might perceive as moderate or normative consumption. Indeed, in the light of increasing treatment demand for cannabis (Montanari, 2004; Simon and Kraus, this monograph), there is considerable demand to operationalise concepts of dependence into measurable criteria, and to inform people of cannabis-related health risks.

Problematic use can be defined as use leading to negative consequences on a social or health level, both for the individual user and for the larger community. From this definition of problematic use, various other concepts can be defined, such as misuse, abuse and dependence, together with difficulties faced in abstaining or controlling use. Harms are either directly linked to the substance itself, for example loss of concentration in the short term or lung damage in the long term (see Witton, this monograph, Vol. 2), or are secondarily harms linked to polydrug use (principally, alcohol and tobacco) or risky behaviour (drug driving, binge patterns). Such risk situations should ideally be detected early by practitioners. By identifying problems early, drugs workers have a window of opportunity to minimise cannabis-induced problems, for instance by referring users to treatment or by taking actions aimed at preventing intensive use and dependence.



Monitoring of cannabis use has been improved since the beginning of the 1990s, partly due to the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), which has developed a European model questionnaire for general population surveys (Bless et al., 1997). Nonetheless, most studies dealing with abuse, problematic use, harmful use or dependence reflect a lack of standardised screening tools<sup>(1)</sup>. And more study is needed on the links between various types of use, socio-demographic characteristics and socio-medical factors.

The literature provides evidence that brief rating scales are well suited for screening purposes, and that instruments with direct questions appear to perform better than scales with more subtle questions (Rost et al., 1993; Svanum and McGrew, 1995). Yet, there remain many different screening instruments used to measure cannabis use disorders<sup>(2)</sup>. This heterogeneity reflects the diverse goals of researchers and practitioners (which types of uses are to be screened and in which contexts), and of the means they choose to reach them (which types of questions, how many items and what kind of questionnaires). Although there are a number of definitions of cannabis use disorders, those which operationalise specific types of drug use are relatively vague. Furthermore, the way such definitions are translated into questions in screening tools can be very different. This is partly because identifying potentially harmful drug uses is complex and partly because in most countries attempts to distinguish problematic cannabis use from other types of cannabis use are new.

In this chapter we first clarify the different concepts for defining general substance use disorders and how these are applied to cannabis. Second, we describe the various screening instruments which attempt to measure cannabis use disorders, their differences and similarities. Finally, we discuss the various problems with existing screening tools and propose a possible step forward in order to better screen cannabis-related disorders in the future.

## Concepts and their adaptation

The basics of screening potential problematic drug use are (i) establishing criteria to define problem use and (ii) developing questions that can be used to diagnose whether a respondent meets these criteria. Screening typically takes the form of a clinical interview between a patient and practitioner. Nonetheless, difficulties can

<sup>(1)</sup> The majority of these tests are conceived for all the psychoactive substances then adapted to cannabis; the others were specifically conceived for this product.

<sup>(2)</sup> Recent European screening can be summarised as follows: Germany: Severity of Dependence Scale (SDS); France: Cannabis Abuse Screening Test (CAST); the Netherlands: CIDI modified plus additional ad hoc scale; Poland: Problematic Use of Marijuana (PUM); Portugal: Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV scale); Spain: *Estudes* study, combining CAST, SDS and the abuse subscale of the DSM-IV.





be encountered by the researchers, practitioners and respondents. This section does not focus on cannabis use or particular screening tests. Instead, it deals with three questions which should precede screening: 'what is problematic use of drugs?', 'how is problematic use best screened?' and 'will the screening process give us relevant and reliable information?'

## Concepts

The concepts of drug use disorders have a history. Until the middle of the 20th century the clinical study of drug addiction was characterised by many different theoretical approaches. Theory shifted to practical definition within a number of international standardised grids describing the disorders associated with drug use. Since this period, criteria have been modified alongside evolution in research and in interpretations of *dependence*. The term 'dependence' was borrowed from psychopharmacology, where it referred to tolerance and withdrawal, and was used more generally to replace the term *addiction* by a WHO Expert Committee in 1964. Edwards et al. (1981) introduced cognitive and behavioural signs and symptoms to the concept, and dependence became both behavioural and physical. Thanks to Goodman (1990), behavioural criteria gained more importance and the concept of dependence could be used to describe addictions without a drug, for example addiction to gambling. Dependence might also include a physical dependence characterised by pharmacological criteria (Kaminer, 1994; Bailly, 1997, 1998).

Today, the most widely accepted definitions of use disorders are *harmful use*, *abuse* and *dependence*. These are defined by a list of criteria. *Harmful use* and *dependence* are defined in the International Classification of Diseases (ICD-10), Section F10–F19<sup>(3)</sup>, of the World Health Organisation, a concept developed from a European perspective, whereas the American Psychiatric Association's *Diagnosis and Statistical Manual of Mental Disorders* (DSM-IV)<sup>(4)</sup> defines *abuse* and *dependence* — a concept developed from a US perspective.

*Abuse* under DSM-IV and *harmful use* under ICD-10 can be regarded as immediate damaging use for the individual, and are parts of a continuum that ranges from abstinence to dependence. Abuse may involve legal problems resulting from use, for example arrests for substance-related problems, and risky behaviours, such as use in physically hazardous situations, which are not included in the definition of *harmful use*. Yet, despite their differences, both take into account problems linked to the wider environment of the user, such as reproaches from the family circle or personal or social

<sup>(3)</sup> [www.who.int/classifications/apps/icd/icd10online](http://www.who.int/classifications/apps/icd/icd10online)

<sup>(4)</sup> [www.dsmivtr.org](http://www.dsmivtr.org). DSM-IV is currently in the process of being updated to a new manual, DSM-V.



## Measuring cannabis-related problems and dependence at the population level

difficulties associated with use. Still, neither definition allows us to classify cases in terms of staggered stages of increasing gravity, and concepts of dependence *stricto sensu* require further definition.

Two other components make up the definition of dependence according to DSM-IV: *physiological* and *psychological dependence*. *Physiological dependence* comprises tolerance and withdrawal. Tolerance is defined by the need for increased amounts of the substance to achieve the original effects of the substance, or a markedly diminished effect with continued use of the same amount of the substance (criterion 1). The withdrawal symptom (used in criterion 2) is described as a maladaptive behavioural change that occurs when the substance concentration declines in an individual who has maintained prolonged heavy use of the substance (APA, 1994). Psychological dependence includes compulsive use (criteria 3, 4, 7), intensity of use (criterion 5) and consequences of use (criterion 6). These concepts may be found in most of the existing drug screening tests, whether specific to cannabis or not.

In Europe, some definitions of substance use problems are not based on ICD-10 or DSM-IV concepts, but are purely pragmatic. One is the EMCDDA's definition of problematic drug use as injection or regular use of opiates, cocaine, crack and/or amphetamines. The EMCDDA uses its definition of problematic use as one of its key indicators, and the definition is helpful in establishing a link with its key indicators on drug-related infectious diseases and drug-related deaths and mortality.

Work is still ongoing in Europe in defining problematic use of cannabis. One approach used in general population surveys is to assess problematic use by measuring 'intensive use', which can be defined through indicators of intensity or frequency of use (Simon, 2004). This notion is based on the idea that the use is problematic above a certain excess threshold. This makes sense, but its definition is arbitrary and not based on medical criteria. Furthermore, many studies have shown that a statistical link between problems and use appears even at very low levels of use (Ramström, 2003), although this link must be cautiously interpreted as it varies with other variables such as gender, age, socio-economic context and the illegal status of the drug. Nonetheless, intensive use is useful in identifying those who are more at risk of developing problems linked to cannabis use.

Such criteria of problematic drug use play a practical role in diagnosis, alerting practitioners to problem patterns and enabling immediate diagnosis of harms. Nonetheless, difficulties remain in shifting from abstraction to action, i.e. to develop practical screening instruments for cannabis use disorders:

- Definitions of substance use disorders do not easily translate into screening tool questions.





- Problems related to consumption are not purely somatic, but embrace other aspects of the user's environment — associated risks, medical, educational, social and legal problems.
- A survey given at a specific time may not be able to gauge the risk of a user, for example mid- or long-term problems that have not yet transpired.

## From concepts to screening tests

Screening consists of comparing substance disorder criteria — that is, the concept defining harmful use — against the actual pattern of use. This process can provide a variety of insights on the side of both the practitioner and patient or respondent, which are open to diverse interpretation. Thus, it is crucial to design a questionnaire that adequately reflects the criteria defining problematic use, and which ensures that responses are accurate, valid and actionable. There are basic delivery issues too: the context of use and population sample (adults, children, at school, at clinics, etc.) determines how questions are worded, how many questions are asked, how questionnaires can 'fork' to provide further details, and so on.

Harmful use criteria can differ from one population to another. Harrison et al. (1998) showed, for example, that DSM-IV does not completely fit adolescents. Within DSM-IV, criteria applicable to adolescents are often absent for concepts such as withdrawal, tolerance or giving up other activities providing pleasure and interest. Thus, it has been argued that DSM-IV concepts, when applied without adaptation to adolescents, do not deliver the prognostic value they have for adults (Bukstein and Kaminer, 1994). According to many researchers, current tools made for the screening of adults only deliver a late screening of youth-specific problems. So, it has become common for research teams working on adolescents to try to develop their own tools (Inserm, 2001).

## Validation and quality measures

Measuring the quality of a screening test is not easy. As stated, a test must be theory based and should correctly screen users according to a harmful use concept. This concept must be clarified through a reference test, i.e. a 'dry-run' test that may or may not offer the kind of responses one obtains during actual use of the test. Thus, validation of the screening test needs to be iterative, based on comparing actual responses with the reference test, and tweaking the screening test accordingly. This process can be split into two basic tasks: first, comparing the screening test with the reference test; and, second, assessing the quality of the screening test (and its reference test) in a clinical situation in which a practitioner's diagnosis can be compared with the result of the test. While it is not our aim to summarise best practices in survey validity here, validity can be tested



in a number of ways: completeness (Have all questions been answered? In the right sequence?); respondent base (Has the test been adequately prepared? Have sufficient respondents been used to test the practicality of the test? Have respondents answered sincerely and have interviewers correctly recorded responses?); and logic (Does the test reflect the harmful use concept? Can conclusions be generalised across the respondent base? And are other plausible explanations ruled out?). While preparation does not guarantee the ideal screening instrument, it is possible to avoid common pitfalls and to 'build in' validation into clinical interviews or in general population surveys.

## Existing screening tests for cannabis use disorders

Standardised early screening instruments have been used for tobacco (Fagerström and Schneider, 1989) and alcohol (Daepfen, 2004) for a long time. These tools are used as an aid in informing a diagnosis in a clinical situation, and also as an epidemiological tool in general population surveys among adults or adolescents in order to measure the levels of the different patterns of use. For alcohol, the most common instruments are the Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al., 1993) and the CAGE test (Cut down, Annoyed, Guilty, Eye-opener test) (Ewing, 1984).

For other drugs, a large number of tests exist. Most have been developed for use with all drugs but can be adapted to a specific drug. For example, the Severity of Dependence Scale (SDS), was conceived for heroin and opiates (Gossop et al., 1995), and then adapted for cocaine and amphetamines, and recently for cannabis (Swift et al., 1998; Kraus et al., 2005). A literature review on screening tests and on their validation, describing the great diversity of what is available, has been conducted in France (Beck and Legleye, 2007a).

For cannabis, available screening tests are relatively recent and rarely used in general population surveys. In the 1990s, assessment instruments such as the Composite International Diagnostic Interview (CIDI) and the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) have been used in several general population surveys, but their ability to measure cannabis dependence and cannabis abuse remains a matter for discussion (Compton et al., 1996). One difficulty is that contexts and motivation for use vary greatly among heavy cannabis users. Heavy use can develop both through solitary use, for example to manage stress or enable sleep, and in social settings, for example at recreational events or among peers. The same respondent can report both recreational use and harmful effects due to use.

A good example of adaptation of the concept of dependence into a set of questions can be found in aggregated data from three waves (1991 to 1993) of the US National

Household Survey on Drug Abuse (NHSDA)<sup>(5)</sup>, with 87 915 respondents aged 12 and over (Kandel et al., 1997). For this survey, a measure of cannabis dependence was developed, inspired by DSM IV (see Appendix A). The test asked questions about tolerance, withdrawal, loss of control, how much time spent on using cannabis, negative consequences for daily life, and continued use despite knowing that cannabis causes significant problems.

Among adolescents, problems associated with physical cannabis dependence appear to be rare (Beck et al., 2004), although they are reported in some studies (Dennis et al., 2002; Martin et al., 2005). Adolescents reporting problems seem to suffer more from psychological dependence, exacerbated by the fact that cannabis is almost always mixed with tobacco. Adolescents also appear more likely to experience risky situations, concentration and motivation difficulties or problems in their relationships with their family and friends (Obradovic, 2006). However, many of these factors might derive from the fact that cannabis is an illegal substance.

As dependence is considered to be the last and most harmful stage of use, screening in general population surveys rarely aims to detect dependence and its symptoms, although there are some exceptions (e.g. the OPCS Surveys of Psychiatric Morbidity in the 1980s and 1990s in the United Kingdom; the ESA survey in Germany; the Australian National Drug Strategy Household Survey). Some questions related to dependence criteria may be included in some tests, for example the screening carried out by the Alcohol Advisory Council of New Zealand (ALAC, see Appendix A). However, other tools could be used for this purpose, such as SDS or MINI Cannabis, or the instrument developed by Kandel et al. (1997), with questions from the NHSDA.

There have been several recent attempts to develop a scale measuring problematic cannabis use. These screening instruments intend to measure problems related to cannabis use in various areas:

- (i) consumption per se;
- (ii) physical dependence (withdrawal and tolerance);
- (iii) psychological dependence;
- (iv) social harm from use (legal difficulties, harm to relationships, work role harm, etc.);  
and
- (v) health harm due to use (memory loss, physical ailments, casualties, etc.).

Many of these are familiar. DSM-IV and ICD-10 include the second and third of these dimensions in their definition of *dependence*. ICD-10 includes item (v) as *harmful* use. DSM-IV includes criteria from items (iv) and (v) as *abuse*. Some diagnostic

<sup>(5)</sup> NHSDA is a household survey conducted by the federal government's Substance Abuse and Mental Health Services Administration (SAMHSA).



instruments also include these criteria, although they sometimes also include other harms, for example guilt or deviance from a standard context of use. Some items, like the reproaches of relatives, may enter many categories, such as social harm, health problems or dependence. Solitary smoking may indicate either dependence or social harm.

## Screening scales used among adults

Although they seem to underestimate heroin, cocaine or amphetamine use disorders, general population surveys can be used to give a relevant estimate of cannabis use disorders (Rhem et al., 2005). The 2003 Epidemiological Survey on Substance Abuse (ESA) in Germany employed the Severity of Dependence Scale (SDS), as proposed by Gossop et al. (1995), to measure cannabis dependence (see Appendix A). This general population survey (self-administered questionnaires) was carried out with a sample of 8061 adults aged 18–59 years. The SDS was used to identify subjects who showed signs of cannabis dependence. A score of three or more points was taken as a cut-off point for cannabis-related problems. Overall, 1.1 % of the sample exceeded the threshold of three or more points on the SDS and were characterised as cannabis dependent (Kraus et al., 2005). The scale consisted of five items, with each scored on a four-point scale (0–3). The greater the score, the higher the degree of psychological dependence. The total score is obtained through the addition of the five-item ratings. The scale explores strictly psychological dependence and no other areas of harm.

A team from New Zealand used the Cannabis Use Disorders Identification Test (CUDIT, see Appendix) screening instrument (Adamson and Sellman, 2003), derived by modifying the AUDIT test for alcohol (Saunders et al., 1993). This 11-question scale aims to screen for cannabis abuse or dependence. It was used in a clinical sample of alcohol-dependent adults who reported some cannabis use over the preceding six months ( $n = 53$ ). The scale was compared with the self-reported frequency of cannabis use in the preceding six months. The scale explores the nature of consumption per se, including intensity of use and compulsive use, physical dependence, psychological dependence, social harm from use, health harm due to use, and also guilt and reproaches or blame from relatives. Several queried items could be classified as linked to more than one harm, for example cannabis consumption in the morning.

According to the authors, on the basis of the Diagnostic Interview for Genetic Studies (DIGS) providing a DSM-IV diagnosis (Nurnberger et al., 1994), the CUDIT test was better than a frequency measure (at least 80 days using cannabis), achieved positive predictive power of 84.6% and sensitivity of 73.3% at a cut-off of 8, compared with positive predictive power of 81.8% and sensitivity of 60.0% for the frequency measure. Such results indicate the viability of the CUDIT measure for identifying cannabis use





disorder in risk populations, and its use for the general population should be assessed. However, one general problem of this scale is that the reference period (6 months) would need to be adapted to European standards (last month, or last year use), defined by EMCDDA.

On several French prevention websites, a cannabis-specific adaptation of the CAGE (Cut down, Annoyed, Guilty, Eye-opener) alcohol screening test has been tried to enable self-evaluation of problematic cannabis use. CAGE explores four areas of harms: psychological dependence, social harm, guilt and physical dependence. Two positive answers out of a possible four is interpreted as indicating problematic cannabis use (Midanik et al., 1998). The test has never been validated in its cannabis version. It should, however, be noted that the alcohol version has been criticised by Bisson et al. (1999). Moreover, CAGE is not recommended as a brief alcohol screening test among adolescents, as it appears to perform less well than AUDIT or CRAFFT (Knight et al., 2003).

Some surveys focus only on one or two areas of harm; for example, a survey carried out in Ontario (Ferris et al., 1994) explored only health and social harm (see Appendix A). Alternative scales are sometimes created for self-assessment of cannabis use and its impact, such as the one developed by the Jellinek clinic in Amsterdam (Kerssemakers, 2000)<sup>(6)</sup>. The Know cannabis test has 16 questions, and can be filled out on a website. The result is accompanied by recommendations for the cannabis user. The scale explores multiple consequences of cannabis consumption per se, including spending money and compulsive use, polydrug use, motivations for use, dependence, social harm, guilt, health consequences and reproaches and blame from relatives. Again, some items may explore more than one area of harm.

## Screening scales used in the youth population

Several recent studies have explored the feasibility of measuring adolescent cannabis use disorders in the general population. In Poland, a study in progress aims to assess the accuracy of a test focused on problematic herbal cannabis use in an adolescent population (Okulicz-Kozaryn and Sieroslowski, 2005). In France, Chabrol et al. (2000) conducted a study on abuse and dependence, according to the DSM-IV criteria, in a school survey. They used the MINI cannabis screening test, derived from the Mini Neuropsychiatry International Interview (Lecrubier et al., 1997; Sheehan et al., 1997; see Appendix A). The MINI tests for cannabis dependence as well as for cannabis abuse.

<sup>(6)</sup> The Jellinek test can be taken at [www.knowcannabis.org.uk](http://www.knowcannabis.org.uk) and [www.jellinek.nl/zelfhulp/cannabis](http://www.jellinek.nl/zelfhulp/cannabis)



## Measuring cannabis-related problems and dependence at the population level

In France, the Cannabis Abuse Screening Test (CAST) (see Appendix) was constructed to be used in general population surveys. It was used in a sample of 20 000 adolescents in the ESCAPAD survey (Beck and Legleye, 2003). CAST explores consumption per se, deviance from a common standard of use, health and social harm, and reproaches from relatives and dependence. It aims to determine two kinds of populations: adolescents with no problem and adolescents who need a diagnosis on their cannabis use (Karila et al., 2004). Clinical validation of CAST is in progress in a partnership between the French monitoring centre for drug and drug addiction (OFDT) and two specialised centres for cannabis use prevention and treatment.

CAST is used both in general population surveys and in cannabis consultation to screen problematic cannabis users and to refer them to the appropriate service. Thresholds enable practitioners to normalise the interview with the person in consultation and to gauge whether the cannabis use pattern is potentially problematic. Two positive answers highlight the need for the person to be careful about use. Three or more positive answers indicates that the use may be problematic and the person should be offered a specialised consultation to obtain help to diminish or stop use, thereby alerting clinicians that a deeper assessment is warranted. Other tests are also in the process of clinical validation in this study, such as the French versions of the CRAFFT and of the ALAC tests used as self-administered evaluation instruments. The ALAC questionnaire (see Appendix A) for the self-evaluation of cannabis use is recommended by the Alcohol Advisory Council of New Zealand (1996). Two positive answers indicate a moderate risk of abuse, and three positive answers indicate a strong risk of abuse. The ALAC questionnaire has not yet been validated, but it aims to assess the harms of reproaches, health problems, dependence and social problems. It appears to be problematic compared with the other tests, as several of the questions do not mention drugs at all.

## Longer screening tests

Other scales, which query a greater number of harms, have been used among specific populations. For example, the Cannabis Problems Questionnaire (CPQ) was very recently modelled (Copeland et al., 2005; Martin et al., 2006) on the 46 items of the Alcohol Problems Questionnaire (APQ; Williams and Drummond, 1994). The study was conducted among 72 adolescents smoking at least 15 days per month. It left the final CPQ as a 22-binary-item scale, which seems to be an efficient and reliable measure of cannabis-related problems for use with populations of current cannabis users, offering more than 80% sensitivity and specificity, according to DSM IV criteria.

Heishman et al. (2001) have developed and validated the Marijuana Craving Questionnaire (MCQ), a 47-item multidimensional questionnaire on marijuana craving, based on the model of the Questionnaire on Smoking Urges (Tiffany and Drobos,



1991) and the Cocaine Craving Questionnaire (Tiffany et al., 1993). In their study, current marijuana smokers ( $n = 217$ ) not seeking treatment completed forms assessing demographics, drug use history, marijuana quit attempts and current mood. The findings suggested that four specific constructs characterise craving for marijuana: compulsivity — an inability to control marijuana use; emotionality — use of marijuana in anticipation of relief from withdrawal or negative mood; expectancy — anticipation of positive outcomes from smoking marijuana; and purposefulness — intention and planning to use marijuana for positive outcomes. Heishman et al. (2001) found that the MCQ is a valid and reliable instrument for assessing marijuana craving in individuals not seeking drug abuse treatment, and that marijuana craving can be measured in the absence of withdrawal symptoms.

The Marijuana Effect Expectancy Questionnaire (MEEQ) assesses motivation to use marijuana (Schafer and Brown, 1991). It has 70 yes/no format items with agree/disagree instructions similar to those of the Alcohol Expectancy Questionnaire (AEQ). Subjects are asked to respond according to their own beliefs and whether they have actually used marijuana. Although MEEQ is not designed for general clinical screening, it contains items with potential for screening. It has been tested in a psychometric evaluation on 279 adolescents from a clinical and community sample (Aarons et al., 2001) and on 149 males from a clinical sample (Galen and Henderson, 1999).

The Marijuana Screening Inventory (MSI-X) is a 39-binary-item scale. Thirty-one of the items are used to calculate a simple score to classify into one of the four following categories: no problem; normal or experimental marijuana use; potentially problematic marijuana use; and problematic marijuana use. The study was conducted on a sample of 420 military reservists (a convenience sample). The MSI-X was found to be promising, especially for rapid diagnosis assessment, but a clinical validation is yet to be conducted (Dale, 2003).

These instruments seem, at a first glance, to be too long to apply as part of a general population survey. The application of such instruments requires more time than available in most cases in population surveys, and sometimes skilled interviewers, too. They have only been tested in clinical populations, which might not be sufficient to assess their applicability in the general population.

## Discussion

This chapter presents the main tools aiming to screen different kinds of cannabis use and problems resulting from it. It is not an exhaustive presentation of the published literature, yet it provides concise discussion of the concepts and tests developed so far.



## Measuring cannabis-related problems and dependence at the population level

There is evidence that cannabis use sometimes leads to problems, and these problems are now a major concern in the field of public health. As a consequence, many surveys try to evaluate the proportion of cannabis users who suffer problems resulting from cannabis use or the proportion of dependent users. The largest recent surveys were conducted in the USA and Australia. Estimations vary and depend on the instruments used. In Australia, the National Survey of Mental Health and Well-being conducted a study in 1997 among a representative sample of 10 600 people of the Australian population aged 18 and over, and used DSM-IV and ICD-10 diagnoses. Swift et al. (2001) found that 1.5% (DSM-IV) or 1.7% (ICD-10) of this population was cannabis dependent, with marked differences in symptom prevalence. The proportions among cannabis users during the last 12 months were 21% (DSM-IV) and 22% for ICD-10. In the USA, according to a recent NHSDA survey (SAMHSA, 2002), 2% of people aged 12 and over fulfilled DSM-IV criteria for cannabis dependence or abuse during the last 12 months. The proportion among those aged 18–25 years was 6%. According to this survey, 17% of last year cannabis users fulfilled criteria for cannabis dependence or abuse.

The concepts and definitions used in the DSM and in the ICD are controversial, and not all studies support the idea that cannabis smokers develop *dependence* as well as *abuse* (see also Witton, this monograph, Vol. 2). In a study by Hollister (1986), for instance, cannabis was given to subjects for a certain period of time in order to study the effects of interruption of the supply. The first attempts failed, but this may be due to amounts of cannabis, which were too small, and a period of supply, which was too short, for ethical reasons. Many authors do, however, confirm that dependence can occur with long-term use: patients who receive significant doses over a long period of time develop symptoms such as occasional perspiration, slight nausea, anxiety and sleeplessness (Compton et al., 1990; Jones, 1996; Crowley et al., 1998; Haney et al., 1999a,b; Vandrey et al., 2005). Despite this general agreement, Jones (1996) emphasises that frequency of dosing and dose interval are more important than daily dose for producing a cannabis withdrawal syndrome. Typical patterns of cannabis use appear to be non-optimal conditions to get an obvious withdrawal syndrome, though less obvious symptoms may be relevant when treating cannabis-dependent patients. Smith (2002) points out that these symptoms are not specific for cannabis (they can be observed with tobacco) and vary with the psychological profile of the individual. Coffey et al. (2002), argue that tolerance might be useless in clinical assessment of cannabis dependence.

The list of criteria used for psychological dependence for all drugs in the DSM-IV definition of dependence appears non-exhaustive. In addition, some of these criteria have been criticised for not seeming relevant for certain researchers (Soellner, 2002). For example, criterion 7, dealing with the continuation of use despite the recognition of its contributing role to some psychic or physical problems, ignores the eventuality that the user might have no intention of stopping use and, on the contrary, might rationally



choose to continue to use it because it provides greater benefits. This possibility has not been investigated. Indeed, the challenge of adapting a generic mental health standard, such as DSM-IV, to use of a specific drug is illustrated in the discrepancy between DSM-IV's definition of dependence for all drugs and the criteria it proposes for cannabis.

Problems with conceptualising harmful use and thresholds are compounded by the difficulties of developing the screening tools themselves. Measures such as MINI use items from the 'problem domain' and refer to them as criteria of dependence. It also seems problematic to define dependence by its consequences, for example criterion 6 in the DSM-IV. As the definition of dependence is so strictly delimited in DSM, a link between dependence and its potential consequences cannot be proven (Soellner, 2002). 'Drift' in the use of items from the problem domain can also be criticised as these items do not measure whether users intend to quit. Intention to quit is crucial, as research shows that cannabis users argue that they would and could quit if cannabis consumption led to suffering (Swift et al., 1998), and cannabis use is not necessarily viewed as a problem by dependent users.

Other variables are also problematic. Some of the dependence criteria, such as spending a great deal of time around the substance, might be confounded by the illegality of the drug (this is a problem for MINI and ICD-10, for instance). In CUDIT and CAGE there is a question about feelings of guilt after using cannabis, which could also be confounded by the illegality of the drug. Thus, most screening measures combine the dimensions of psychological dependence and harm. This is true of CUDIT, MINI and CAST, and thus it is not clear what they are screening for: dependence? Or abuse? These are concepts that DSM-IV makes a serious attempt to separate, and combining the two areas is problematic for an illicit substance: many of the problems have resulted from the fact that cannabis is illegal.

In general, analysis of diagnostic tools, such as DSM-III, DSM-IV and ICD, used as severity scales for drug dependence shows that diagnostic algorithms greatly influence the results (Langenbucher et al., 1995). A comparison between DSM-III R and DSM-IV emphasises the influence of the evolution of the diagnostic criteria on the screening results (Mikulich et al., 2001). These problems question the very nature of the concepts of addiction: what should be measured, why and how?

An examination of concepts used in American and European definitions of the stages of drug use disorders reveals some cultural differences. For example, the definition of *drug abuse*, according to the American DSM-IV, contains moral criteria and characteristics, either in the concepts themselves or in the wording of the concepts, whereas the European definition of *harmful use*, according to the ICD-10, seems more pragmatic. Law transgression or failing in social roles are included in DSM-IV's definition of *abuse*, in addition to *using despite knowledge that damage results from use*. Use in hazardous



situations, such as driving, may be seen as risky behaviour that increases risk of being injured or of causing injury, yet an accident may never occur. In DSM-IV's definition of dependence, criterion 7 presupposes that use itself is bad, even if it brings a benefit and contributes to the psychological balance of the user, who might have made a rational decision to continue using. In a sense, the user under DSM-IV is presupposed to have a social duty and responsibility: he or she must conform to social and legal norms. Users' knowledge of the law and their psychological reaction both contribute to the definition of *abuse*. Such moral rationale seems less present in ICD-10's definition of *harmful use*, although these concepts should perhaps be examined when defining drug-related harm.

## Conclusion

Measuring the proportion of problematic or dependent cannabis users from among the wider cannabis user base is complex. It presents far more challenges than measuring prevalence by lifetime or last month cannabis use in general population surveys. Faced with an increase in cannabis use, policymakers may choose to add some tools to general population surveys or the monitoring instruments used by addiction treatment centres.

Today, a great number of concepts and tools exist to monitor problematic cannabis use, and they vary in terms of both quality and robust scientific validation. Nonetheless, these instruments do offer valuable insights into use patterns. Implementing a common screening tool, even if not validated, can deliver important information to inform the fields of prevention and treatment. Policymakers should be prepared for some criticism based on the lack of consensus surrounding dependence and abuse, but screening at least delivers a base of knowledge that can be used by specialists in defining public policy.

There is clearly a need to develop screening tools that are more reliable in measuring adverse effects of cannabis use than those presently in use. Some existing instruments, such as CIDI and CAST, go some way to providing a standard, practical tool, and can provide a basis for further work. In Europe, screening projects for cannabis are under way in Germany, France, the Netherlands, Poland, Portugal, the United Kingdom and, most recently, Spain (EMCDDA, 2007). It is hoped that such initiatives will help to develop a reliable and comparable indicator of problematic cannabis use in the general population.

## Acknowledgement

The authors would like to thank Robin Room, Sharon Rödner Sznitman, Wendy Swift and John Witton for their helpful advice and comments.



## Appendix A: List of tests and references

A	DSM-IV dependence adapted in National Household Survey on Drug Abuse	Kandel et al. (1997)
B	SDS (Severity Dependence Scale)	Gossop et al. (1995)
C	CUDIT (Cannabis Use Disorders Identification Test)	Adamson and Sellman (2003)
D	CAGE-cannabis	Midanik et al. (1998)
E	Ontario alcohol and other drug opinion survey	Ferris et al. (1994)
F	Know cannabis test	Kerssemakers (2000)
G	MINI-cannabis	Leclubier et al. (1997), Sheehan et al. (1997)
H	CAST (Cannabis Abuse Screening Test)	Beck and Legleye (2003)
I	ALAC (Alcohol Advisory Council of New Zealand)	ALAC (1996)
J	CPQ (Cannabis Problem Questionnaire)	Copeland et al. (2005)
K	MCQ (Marijuana Craving Questionnaire)	Heishman et al. (2001)
L	MEEQ (Marijuana Effect Expectancy Questionnaire)	Schafer and Brown (1991)
M	MSI-X (Marijuana Screening Inventory)	Dale (2003)

### A: Measuring cannabis dependence based on DSM IV (Kandel et al., 1997) (the numbers refer to DSM items, the following sentences to the corresponding question in the NHSDA)

- 1 Tolerance: during the past 12 months, for which drugs have you needed larger amounts to get the same effect; that is, for which drugs could you no longer get high on the same amount you used to?
- 2 Withdrawal: for which drugs have you had withdrawal symptoms; that is, you felt sick because you stopped or cut down on your use of them during the past 12 months?
- 3 Greater use than intended: which drugs have you felt that you needed or were dependent on in the past 12 months?
- 4 Unsuccessful efforts to cut down or control: during the past 12 months, for which drugs have you consciously tried to cut down on your use? During the past 12 months, for which drugs have you been unable to cut down on your use, even though you tried?
- 5 Great deal of time spent in using: have you used three joints or more nearly daily (three times or more a week) in the past 30 days; or 2 oz or more (86 joints or more or 43 g or more) in the past 30 days; or traded service for cannabis?
- 6 Reduction in social, occupational or recreational activities: as a result of drug use, at any time in your life, did you, in the past 12 months, get less work done than usual at school or on the job?
- 7 Continued using cannabis despite knowing it caused significant problems: as a result of drug use at any time in your life, did you in the past 12 months ... (become depressed; have arguments/fights with family and friends; feel completely alone and isolated;



## Measuring cannabis-related problems and dependence at the population level

feel very nervous and anxious; find it difficult to think clearly; have health problems; feel irritable and upset; feel suspicious and distrustful of people; find it harder to handle your problems; have to get emergency medical help; have someone suggest you seek treatment)?.

### **B: SDS (Gossop et al., 1995)**

In the past year:

- A Did you think your use of cannabis was out of control?
- B Did the prospect of missing cannabis or not chasing make you anxious or worried?
- C Did you worry about your use of cannabis?
- D Did you wish you could stop?
- E How difficult did you find it to stop, or go without cannabis?

**C: The Cannabis Use Disorders Identification Test (CUDIT)  
(Adamson and Sellman, 2003)**

A Have you used any cannabis over the past 6 months? Yes No

If yes:

1	How often do you use cannabis?	Never 0	Monthly or less 1	2–4 times a month 2	2–3 times a week 3	4 times a week or more 4
2	How many hours were you 'stoned' on a typical day when you had been using cannabis?	1 or 2 0	3 or 4 1	5 or 6 2	7 to 9 3	10 or more 4
3	How often were you 'stoned' for six or more occasions?	Never 0	Less than monthly 1	Monthly 2	Weekly 3	Daily or almost daily 4
4	How often during the past six months did you find that you were not able to stop using cannabis once you had started?	0	1	2	3	4
5	How often during the past six months did you fail to do what was normally expected from you because of using cannabis?	0	1	2	3	4
6	How often during the past six months have you needed to use cannabis in the morning to get yourself going after a heavy session of using cannabis?	0	1	2	3	4
7	How often during the past six months did you have a feeling of guilt or remorse after using cannabis?	0	1	2	3	4
8	How often in the past six months have you had a problem with your memory or concentration after using cannabis?	0	1	2	3	4
9	Have you or someone else been injured as a result of your use of cannabis over the past six months?	No 0			Yes 4	
10	Has a relative, friend or doctor, or other health worker been concerned about your use of cannabis or suggested that you should cut down over the past six months?	No 0			Yes 4	

### **D: CAGE (Cut down, Annoyed, Guilty, Eye-opener) questionnaire for cannabis smoking (Midanik et al., 1998)**

- 1 Have you ever tried to, or felt the need to, Cut down on your smoking?
- 2 Do you ever get Annoyed when people tell you to quit smoking?
- 3 Do you ever feel Guilty about smoking?
- 4 Do you ever smoke within half an hour of waking up (Eye-opener)?

### **E: Ontario alcohol and other drug opinion survey**

Was there ever (and in the last 12 months) a time that you felt your use of marijuana had a harmful effect on your:

- A friendship or social life?
- B physical health?
- C home life or marriage?
- D work, studies or employment opportunities?
- E financial position?

### **F: Know cannabis test**

Source: Kerssemakers (2000). Also available at [www.knowcannabis.org.uk/](http://www.knowcannabis.org.uk/) and [www.jellinek.nl/zelfhulp/cannabis/](http://www.jellinek.nl/zelfhulp/cannabis/)

- 1 How often do you smoke cannabis?
  - 1 a few times a year (0)
  - 2 once or twice a month (0)
  - 3 once or twice a week (1)
  - 4 almost every day (2)
  
- 2 How much money do you spend on cannabis in an average week? (Base your answer on what you pay, or should have to pay, as a consumer.)
  - 1 3 euros or less (0)
  - 2 3 to 9 euros (1)
  - 3 10 to 25 euros (2)
  - 4 more than 25 euros (2)
  
- 3 How often are you stoned?
  - 1 more than half of the day (2)
  - 2 a few hours every day (2)
  - 3 a few times a week (1)
  - 4 a few times a month (0)
  - 5 once a month or less (0)





- 4 When you smoke cannabis, how often do you light up a second joint or pipe to get extra stoned?
  - 1 never (0)
  - 2 sometimes (0)
  - 3 regularly (1)
  - 4 almost always (2)
  
- 5 Do you ever smoke cannabis in combination with other drugs or alcohol?
  - 1 yes, often (2)
  - 2 yes, sometimes (1)
  - 3 no, never (0)
  
- 6 When do you usually smoke cannabis? (More than one answer possible.)
  - 1 morning (1)
  - 2 afternoon (1)
  - 3 evening (1)
  - 4 night (1)
  
- 7 What are (three of) the most important reasons why you use marijuana and/or hash?
  - 1 it's more fun than drinking alcohol (0)
  - 2 to relieve boredom (1)
  - 3 to feel good (0)
  - 4 I'm just accustomed to taking it/it's part of the game (1)
  - 5 it's nice to smoke with friends (0)
  - 6 to relieve feelings of depression (1)
  - 7 to help me relax, like before going to sleep (0)
  - 8 to perform or concentrate better (1)
  - 9 I forget my problems for a while (2)
  - 10 to change the effects of other substances (drugs or alcohol) (1)
  - 11 I don't know (0)
  
- 8 When you smoke cannabis, what people do you usually smoke with?
  - 1 always with friends (0)
  - 2 usually with friends, but sometimes alone (0)
  - 3 usually alone, and sometimes with friends (1)
  - 4 always alone (2)
  
- 9 Could you stop smoking marijuana or hash whenever you want?
  - 1 no, I couldn't (2)
  - 2 maybe, but it would take me a lot of trouble (1)
  - 3 probably, but not without some trouble (0)
  - 4 sure, I would have no trouble at all (0)



Measuring cannabis-related problems and dependence at the population level

- 10 How often have you thought to yourself in the past year, 'I should cut down or stop'?
- 1 never (0)
  - 2 a few times (0)
  - 3 once a month (1)
  - 4 once a week (2)
  - 5 almost every day (2)
- 11 In the past year, how often has your use of cannabis affected your performance in your work or studies?
- 1 never (0)
  - 2 a few times (0)
  - 3 once a month (1)
  - 4 once a week (2)
  - 5 almost every day (2)
- 12 Do you sometimes put things off or procrastinate because you are stoned?
- 1 no, never (0)
  - 2 yes, sometimes (0)
  - 3 yes, regularly (1)
  - 4 yes, almost always (2)
- 13 Have you ever felt extremely frustrated because you couldn't smoke cannabis when you wanted to?
- 1 no, never (0)
  - 2 yes, sometimes (0)
  - 3 yes, quite often (1)
  - 4 yes, almost always (2)
- 14 How often in the past year have you felt worried about your use of cannabis?
- 1 never (0)
  - 2 a few times during the year (0)
  - 3 a few times a month (1)
  - 4 a few times a week (2)
  - 5 every day (2)
- 15 Do you ever have trouble remembering what you said or did?
- 1 no, never (0)
  - 2 yes, sometimes (0)
  - 3 yes, quite often (1)
  - 4 yes, almost all the time (2)



- 16 Has a friend or acquaintance of yours who also smokes cannabis ever told you that you really need to cut down on marijuana or hash?
- 1 yes, sometimes (0)
  - 2 yes, regularly (1)
  - 3 no (0)
  - 4 no, because they don't know I smoke it (2)

Score ranges:

- 0–5: No added risk, although taking drugs always carries risks.
- 6–15: Definite risk. You're taking too many chances. Try to reduce the risks of your drug use.
- 16–36: Serious risk. Your drug use is getting out of hand.

## G: MINI cannabis (Sheehan et al., 1997)

Considering your use of cannabis in the past 12 months:

- |   |   |     |    |
|---|---|-----|----|
| A | Have you found that you needed to use more cannabis to get the same effect that you did when you first started taking it?   | Yes | No |
| B | When you reduced or stopped using cannabis, did you have withdrawal symptoms (aches, shaking, fever, weakness, diarrhoea, nausea, sweating, heart pounding, difficulty sleeping, or feeling agitated, anxious, irritable, or depressed)? Did you use any drug(s) to keep yourself from getting sick (withdrawal symptoms) or so that you would feel better? | Yes | No |
| C | Have you often found that when you used cannabis you ended up taking more than you thought you would?   | Yes | No |
| D | Have you tried to reduce or stop taking cannabis but failed?  | Yes | No |
| E | On the days that you used cannabis, did you spend substantial time (> 2 hours), obtaining, using or in recovering from the drug, or thinking about the drug?  | Yes | No |
| F | Did you spend less time working, enjoying hobbies, or being with family or friends because of your cannabis use?  | Yes | No |
| G | Have you continued to use cannabis, even though it caused you health or mental problems?  | Yes | No |

Considering your use of cannabis in the past 12 months:

- |   |   |     |    |
|---|---|-----|----|
| H | Have you been intoxicated, high, or hungover from cannabis more than once, when you had other responsibilities at school, at work, or at home? Did this cause any problem?                          | Yes | No |
| I | Have you been high or intoxicated from cannabis more than once in any situation where you were physically at risk (for example, driving a car, riding a motorbike, using machinery, boating, etc.)? | Yes | No |
| J | Did you have legal problems more than once because of your drug use, for example, an arrest or disorderly conduct?  | Yes | No |
| K | Did you continue to use cannabis, even though it caused problems with your family or other people?  | Yes | No |

### H: Cannabis abuse screening test (CAST) (Beck and Legleye, 2003)

	No	Yes
During the last 12 months:		
1 Have you ever smoked cannabis <i>before midday</i> ?	0	1
2 Have you ever smoked cannabis <i>when you were alone</i> ?	0	1
3 Have you ever had <i>memory problems</i> when you smoke cannabis?	0	1
4 Have <i>friends or members of your family</i> ever told you that you ought to reduce your cannabis use?	0	1
5 Have you ever tried to reduce or stop your cannabis use <i>without succeeding</i> ?	0	1
6 Have you ever had problems <i>because of your use</i> of cannabis (argument, fight, accident, bad result at school, etc.)? Which: .....	0	1

### I: ALAC (ALAC, 1996)

1 Have people close to you complained about your cannabis use?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
2 Do you have problems with short-term memory?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
3 Have you experienced 'paranoid' episodes following cannabis use?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
4 Do you consider it difficult to go through a day without a 'joint'?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
5 Do you lack the energy to get things done in the way you used to?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
6 Do you ever worry about the effects of your cannabis use?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
7 Do you have more difficulty in understanding new information? (difficulty in studying)	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
8 Have you ever unsuccessfully attempted to cut down or stop your cannabis use?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
9 Do you like to get 'stoned' in the morning?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
10 Are you spending more and more time 'stoned'?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No
11 Do you experience cravings, headaches, irritability or difficulty in concentration when you cut down or cease cannabis use?	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No

## Bibliography

- Aarons, G., Brown, S., Stice, E., Coe, M. (2001), 'Psychometric evaluation of the marijuana and stimulant effect expectancy questionnaires for adolescents', *Psychology of Addictive Behaviors* 26(2): 219–236.
- Adamson, S. J., Sellman, J. D. (2003), 'A prototype screening instrument for cannabis use disorder: the Cannabis Use Disorders Identification Test (CUDIT) in an alcohol-dependent clinical sample', *Drug and Alcohol Review* 22: 309–315.
- ALAC (1996), *Guidelines for alcohol and drug assessment: a review of alcohol and drug screening, diagnostic and evaluation instruments*, Alcohol Advisory Council of New Zealand, Wellington.
- APA (1994), *Diagnostic and statistical manual of mental disorders*, 4th edn (DSM-IV), American Psychiatric Association, Washington DC.
- Bailly, D. (1997), 'From drug use to drug abuse: a developmental perspective' in *Scientific meeting of the European Chapter of International Association for Adolescent Health*, Lausanne.
- Bailly, D. (1998), 'Inscription du sevrage dans le long terme', in *Troisième conférence de consensus sur les 'modalités de sevrage chez les toxicomanes dépendant des opiacés'*, Paris.
- Beck, F., Legleye, S. (2003), *Drogues et adolescence. Usages de drogues et contextes d'usage entre 17 et 19 ans, évolutions récentes*, ESCAPAD (2002), Rapport OFDT.
- Beck, F., Legleye, S. (2007a), *Screening problematic cannabis use in epidemiological research and in general population: tools, validation and references*, OFDT working paper.
- Beck, F., Legleye, S. (2007b), 'Le repérage des consommations problématiques', in Costes et al. (eds), *Cannabis: données essentielles*, OFDT, Paris.
- Beck, F., Legleye, S., Spilka, S. (2004), *Drogues à l'adolescence. Niveaux et contextes d'usage de substances psychoactives à 17–18 ans en France*, ESCAPAD (2003), Rapport OFDT [www.ofdt.fr/BDD/publications/fr/escap03.htm](http://www.ofdt.fr/BDD/publications/fr/escap03.htm)
- Bisson, J., Nadeau, L., Demers, A. (1999), 'The validity of the CAGE scale to screen for heavy drinking and drinking problems in a general population survey', *Addiction* 94(5): 715–722.
- Bless, R., Korf, D., Riper, H., Diemel, S. (1997), *Improving the comparability of general population surveys on drug use in the European Union*, Final report, commissioned by EMCDDA.
- Bukstein, O., Kaminer, Y. (1994), 'The nosology of adolescent substance abuse' *American Journal on Addictions* 3: 1–13.
- Chabrol, H., Fredaigue, N., Callahan, S. (2000), 'Epidemiological study of cannabis abuse and dependence in 256 adolescents', *Encephale* 26(4): 47–49.
- Coffey, C., Carlin, J., Degenhardt, L., Lynskey, M., Sanci, L., Patton, G. (2002), 'Cannabis dependence in young adults: an Australian population study', *Addiction* 97: 187–194.
- Compton, D. R., Dewey, W. L., Martin, B. R. (1990), 'Cannabis dependence and tolerance production', *Advances in Alcohol and Substance Abuse* 9(1–2): 129–147.
- Compton, W. M., Cottler, L. B., Dorsey, K. B., Spitznagel, L., Mager, D. E. (1996), 'Comparing assessments of DSM-IV substance dependence disorders using CIDI-SAM and SCAN', *Drug and Alcohol Dependence* 41: 179–187.
- Copeland, J., Gilmour, S., Gates, P., Swift, W. (2005), 'The Cannabis Problems Questionnaire: factor structure, reliability and validity', *Drug and Alcohol Dependence* 80(3): 313–319.
- Crowley, T. J., Macdonald, M. J., Whitmore, E. A., Mikulich, S. K. (1998), 'Cannabis dependence, withdrawal, and reinforcing effects among adolescents with conduct symptoms and substance use disorders', *Drug and Alcohol Dependence* 50: 27–37.
- Daeppen, J.-B. (dir.) (2004), 'Interventions brève en alcoologie', *Alcoologie et addictologie* 26(3 suppl.): 3S–40S.
- Dale, A. (2003), 'A marijuana screening inventory (experimental version): description and preliminary psychometric properties', *American Journal of Drug and Alcohol Abuse* 29(3): 619–646.

- Dennis, M., Titus, J., Diamond, G., Donaldson, J., Godley, S., Tims, F., Webb, C., Kaminer, Y., Babor, T., Roebuck, M., Godley, M., Hamilton, N., Liddle, H., Scott, C., The C. Y. T. Steering Committee (2002), 'The Cannabis Youth Treatment (CYT) experiment: rationale, study design and analysis plans', *Addiction* 97(s1): 16–34.
- Edwards, G., Arif, A., Hodgson, R. (1981), 'Nomenclature and classification of drug and alcohol related problems', *Bulletin of World Health Organisation* 59: 225–242.
- EMCDDA (2002), *Annual report on the state of the drugs problem in the European Union and Norway*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2007), *Annual report on the state of the drugs problem in the European Union and Norway*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- Ewing, J. A. (1984), 'Detecting alcoholism: the CAGE questionnaire', *Journal of the American Medical Association* 252: 1905–1907.
- Fagerström, K. O., Schneider, N. G. (1989), 'Measuring nicotine dependence: a review of the Fagerström Tolerance Questionnaire', *Journal of Behavioral Medicine* 12: 159–182.
- Ferris, J., Templeton, L., Wong, S. (1994), *Alcohol, tobacco and marijuana: use, norms, problems and policy attitudes among Ontario adults*, Addiction Research Foundation, Toronto, ARF internal document.
- Galen, L. W., Henderson, M. J. (1999), 'Validation of cocaine and marijuana effect expectancies in a treatment setting', *Addictive Behaviors* 24(5): 719–724.
- Goodman, A. (1990), 'Addiction: definition and implication', *British Journal of Addictions* 85: 1403–1408.
- Gossop, M., Darke, S., Griffiths, P., Hando, J., Powis, B., Hall, W. (1995), 'The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users', *Addiction* 90: 607–614.
- Hall, W., Solowij, N., Lemon, J. (1994), *The health and psychological consequences of cannabis use*, Australian Government Publishing Service, Canberra, pp. 136–139.
- Haney, M., Ward, A. S., Comer, S. D., Foltin, R. W., Fischman, M. W. (1999a), 'Abstinence symptoms following oral THC administration to humans', *Psychopharmacology* 141(4): 385–394.
- Haney, M., Ward, A. S., Comer, S. D., Foltin, R. W., Fischman, M. W. (1999b), 'Abstinence symptoms following smoked marijuana in humans', *Psychopharmacology* 141(4): 395–404.
- Harrison, P.-A., Fulkerson, J.-A., Beebe, T.-J. (1998), 'DSM-IV substance use disorder criteria for adolescents: a critical examination based on a statewide school survey', *American Journal of Psychology* 155: 486–492.
- Heishman, S. J., Singleton, E. G., Liguori, A. (2001), 'Marijuana craving questionnaire: development and initial validation of a self-report instrument', *Addiction* 96(7): 1023–1034.
- Hollister, L. (1986), 'Health aspects of cannabis', *Pharmacological Reviews* 38(1): 1–20.
- Inserm (2001), *Cannabis: quel effets sur le comportement et la santé? Synthèse et recommandations*, Institut national de la santé et de la recherche médicale, Paris.
- Jones, R. T. (1996), 'Cannabis withdrawal syndrome: laboratory artifact or clinically important?', *European Neuropsychopharmacology* 6(Suppl. 3): 2–2(1).
- Kaminer, Y. (1994), *Adolescent substance abuse. A comprehensive guide to theory and practice*, Plenum Medical Book Company, New York.
- Kandel, D., Chen, K., Warner, L. A., Kessler, R. C., Grant, B. (1997), 'Prevalence and demographic correlates of symptoms of last year dependence on alcohol, nicotine, marijuana and cocaine in the U.S. population', *Drug and Alcohol Dependence* 44: 11–29.
- Karila, L., Legleye, S., Beck, F., Donnadieu, S., Corruble, E., Reynaud, M. (2004), 'Consommations nocives de produits psychoactifs: résultats préliminaires de l'étude ADOTECNO', *Alcoologie et addictologie* 26(2): 99–109.
- Kerssemakers, R. (2000), *The Know cannabis test*  
[www.knowcannabis.org.uk/](http://www.knowcannabis.org.uk/)



## Measuring cannabis-related problems and dependence at the population level

- Knight, J. R., Sherritt, L., Harris, S. K., Gates E., Chang, G. (2003), 'Validity of brief alcohol screening tests among adolescents: a comparison of the AUDIT, POSIT, CAGE and CRAFFT', *Alcohol Clinical and Experimental Research* 27(1): 67–73.
- Kraus, L., Augustin, R., Orth, B. (2005), *Illegale Drogen, Einstiegsalter und Trends. Ergebnisse des Epidemiologischen Suchtsurvey 2003* (Illicit drug use, age of onset and trends. Results of the 2003 Epidemiological Survey on Substance Abuse), *Sucht* 51 (Sonderheft 1): S19–S28.
- Langenbucher, J. W., Morgenstern, J., Miller, K. J. (1995), 'DSM-III, DSM-IV and ICD-10 as severity scales for drug dependence', *Drug and Alcohol Dependence* 39: 139–150.
- Leclubier, Y., Sheehan, D., Weiller, E., Amorim, P., Bonora, I., Sheehan, K., Janavs, J., Dunbar, G. (1997), 'The MINI International neuropsychiatric interview (MINI): a short diagnostic structured interview: reliability and validity according to the CIDI', *European Psychiatry* 12: 224–231.
- Legleye, S., Karila, L., Beck, F., Reynaud, M. (2007), 'Validation of the CAST, a general population Cannabis Abuse Screening Test', *The Journal of Substance Use* 12(4): 233–242.
- Lynskey, M., Hall, W. (2000), 'The effects of adolescent cannabis use on educational attainment, A review', *Addiction* 95(11): 1621–1630.
- Martin, G., Copeland, W., Swift, W. (2005), 'The adolescent cannabis check-up: feasibility of a brief intervention for young cannabis users', *Journal of Substance Abuse Treatment* 29(3): 207–213.
- Martin, G., Copeland, J., Gilmour, S., Gates, P., Swift, W. (2006), 'The Adolescent Cannabis Problems Questionnaire (CPQ-A): psychometric properties', *Addictive Behaviors* 31(12): 2238–2248.
- Midanik, L. T., Zahnd, E. G., Klein, D. (1998), 'Alcohol and drug CAGE screeners for pregnant, low-income women: the California Perinatal Needs assessment', *Alcoholism: Clinical and Experimental Research* 22(1): 121–125.
- Mikulich, S. K., Hal, S. K., Whitmore, E. A., Crowley, T. J. (2001), 'Concordance between DSM-III-R and DSM-IV diagnoses of substance use disorders in adolescents', *Drug and Alcohol Dependence* 61: 237–248.
- Montanari, L. (2004), *Clients demanding treatment for cannabis use in Europe in 2002: profile and recent trends*, paper presented at KBS 2004, Helsinki.
- Nurnberger, J. I. Jr., Blehar, M. C., Kaufmann, C. A., York-Cooler, C., Simpson S. G., Harkavy-Friedman, J., Severe, J., Malaspina, D., Reicht, T. (1994), 'Diagnostic interview for genetic studies. Rationale, unique features, and training', NIMH Genetics Initiative, *Arch Gen Psychiatry* 51: 849–859.
- Obradovic, I. (2006), 'Premier bilan des "consultations cannabis"', *Tendances* 50 (September 2006), OFDT, Paris.
- Okulicz-Kozaryn, K., Sieroslawski, J. (2005), *Screen for problematic cannabis and other drug use among adolescents — study of the test's validity*, paper presented at KBS 2005, Riverside, California.
- Ramström, J. (2003), *Adverse health consequences of cannabis use*, National Institute of Public Health, Stockholm.
- Rhem, J., Room, R., Van den Brink, W., Kraus, L. (2005), 'Problematic drug use disorders in EU countries and Norway: an overview of the epidemiology', *European Neuropsychopharmacology* 15(4): 389–397.
- Rost, K., Burnam, M. A., Smith, G. R. (1993), 'Development of screeners for depressive disorders and substance disorder history', *Medical Care* 31: 189–200.
- SAMHSA (2002), *Summary of findings from the 2001 National Household Survey on Drug Abuse. Substance Abuse and Mental Health Services Administration, Office of Applied Studies, Rockville, MD.*
- Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., Grant, M. (1993), 'Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption-II', *Addiction* 88(6): 791–804.





- Schafer, J., Brown, S. A. (1991), 'Marijuana and cocaine effect expectancies and drug use patterns', *Journal of Consulting and Clinical Psychology* 59: 558–565.
- Sheehan, D. V., Lecrubier, Y., Harnett-Sheehan, K., Janavs, J., Weiller, E., Bonora, L., Keskiner, A., Schinka, J., Knapp, E., Sheehan, M., Dunbar, G. (1997), 'Reliability and validity of the MINI International Neuropsychiatric Interview (MINI): according to the SCID-P', *European Psychiatry* 12: 232–241.
- Simon, R. (2004), *Regular and intensive use of cannabis and related problems: conceptual framework and data analysis in the EU member states*, Final report to EMCDDA, CT.2003.103.P1.
- Simon, R., Kraus, L. (2007), 'Has treatment demand for cannabis-related disorders increased in Germany?', this monograph.
- Singleton, E. G., Trotman, A. J., Zavier, M., Taylor, R. C., Heishman, S. J. (2002), 'Determinants of the reliability and validity of the marijuana craving questionnaire using imagery scripts', *Exp Clin Psychopharmacol* 10(1): 47–53.
- Smith, N. (2002), 'A review of the published literature into cannabis withdrawal symptoms in human users', *Addiction* 97(6): 621–632.
- Soellner, R. (2002), 'Dependence on cannabis — an everlasting issue' *Substance Use and Misuse* 40: 857–867.
- Svanum, S., McGrew, J. (1995), 'Prospective screening of substance dependence: the advantages of directness', *Addictive Behavior* 20: 205–213.
- Swift, W., Hall, W., Didcott, P., Reilly, D. (1998), 'Patterns and correlates of cannabis dependence among long-term users in an Australian rural area', *Addiction* 93(8): 1149–1160.
- Swift, W., Hall, W., Teesson, M. (2001), 'Characteristics of DSM-IV and ICD-10 cannabis dependence among Australian adults: results from the National Survey of Mental Health and Wellbeing', *Drug and Alcohol Dependence* 63(2): 147–153.
- Tiffany, S. T., Drobos, J. D. (1991), 'The development and initial validation of a questionnaire on smoking urges', *British Journal of Addiction* 86: 1467–1476.
- Tiffany, S. T., Singleton, E., Haertzen, C. A., Henningfield, I. E. (1993), 'The development of a cocaine craving questionnaire', *Drug and Alcohol Dependence* 34: 19–28.
- Vandrey, R., Budney, A. J., Kamon, J. L., Stanger, C. (2005), 'Cannabis withdrawal in adolescent treatment seekers', *Drug and Alcohol Dependence* 78: 205–210.
- WHO Expert Committee on Addiction-Producing Drugs (1964), *13th Report*. Geneva: WHO, Technical Report Series, No. 273.
- Williams, L., Parker, H. (2001), 'Alcohol, cannabis, ecstasy and cocaine: drug of reasoned choice amongst young adult recreational drug users in England' *International Journal of Drug Policy* 12: 397–413.
- Williams, B. T. R., Drummond, D. C. (1994), 'The Alcohol Problems Questionnaire: reliability and validity', *Drug and Alcohol Dependence* 35: 239–243.





# Chapter 3

## Patterns of cannabis use among students in Europe

**Keywords:** adolescent prevalence – cannabis – epidemiology – Europe – ESPAD  
– schools – survey

### Setting the context

Cannabis is the most used illicit drug among adolescents in Europe. The European School Survey Project on Alcohol and Other Drugs (ESPAD) is the key transnational instrument for comparing adolescent cannabis consumption in Europe. This chapter provides a summary of recent ESPAD findings on cannabis.

Use of alcohol, illegal drugs and other substances among young people is of great concern in all countries. Acute consequences can be harmful for the individual and negatively affect the development and future well-being of an adolescent. Another concern is that the heavier the use in adolescence, the larger the risk an individual may encounter substance-related problems in the future<sup>(1)</sup>.

The literature is plentiful on suggested associations between early-onset drug consumption and wider psychosocial problems, both in late adolescence and in later adulthood<sup>(2)</sup>. However, cannabis is usually placed in a wider psychosocial context of risk factors, and direct causal links are not attributed to the drug. Still, studies among youth detention centres and school drop-outs, for example, highlight associations between delinquent behaviour and high prevalence of intensive drug or alcohol consumption<sup>(3)</sup>.

<sup>(1)</sup> For a wider discussion of risk factors and cannabis use, see Coggans, this monograph.

<sup>(2)</sup> A review of psychosocial correlates with ESPAD data (Bulgaria, Croatia, Greece, Romania, Slovenia and United Kingdom) was recently carried out (Kokkevi et al., 2007).

<sup>(3)</sup> A study in Spain by the Centro de Estudios sobre Promoción de la Salud (CEPS, 2004) of a sample of youths at protection and reform centres found approximately one-third reported weekly cannabis use. Two Dutch studies (Korf et al., 2005; Vreugdenhil, 2003) also reported high prevalence of cannabis use among youths in detention centres (see Dutch National Focal Point, Netherlands National report, 2006).

Moving from deviant patterns to normative behaviour, studies have suggested correlations between cannabis use and impaired educational performance, and (less strongly) occupational performance, interpersonal relationships, mental health issues and suicide<sup>(4)</sup>.

There is also a strong economic argument for building strong epidemiological data to inform cannabis prevention activities<sup>(5)</sup>. With school drug prevention budgets in the larger Member States running to tens of millions of euros, it is not surprising that debate in the area is lively. Points of contention include: the 'gateway' or 'stepping stone' theory (cannabis use as a risk factor for use of 'harder' drugs)<sup>(6)</sup>; effects on adolescent neurological development (including some genetic predisposition debate); means to evaluate the efficacy of programmes<sup>(7)</sup>; polydrug patterns in adolescents, in particular correlations to alcohol, tobacco and inhalant misuse; the dangers of episodic or 'binge' patterns; the role to be played by prevention actors (peers, teachers, family, drugs workers, police); and delivery of drug prevention in the context of general health programmes (smoking, alcohol, sex education, obesity, healthy lifestyles)<sup>(8)</sup>.

Beyond the enormous volume and varied quality of school prevention and harm reduction materials (websites, brochures, films, cartoons, posters), a number of recent European publications have sought to distil the research literature into practical publications. Resources include practical guidelines for teachers and parents<sup>(9)</sup>, screening instruments<sup>(10)</sup> and grey literature (see Appendix). On the internet, the *Drugs*

<sup>(4)</sup> A useful synthesis is given by Hall and Pacula (2003); see further reading list. Key studies include: Lysney and Hall (2000); Macleod et al. (2004); the ESTUDES project (Spain, 2004); and Silva and de Deus (2005).

<sup>(5)</sup> For a wider discussion of prevention in Europe, see Burkhart, this monograph.

<sup>(6)</sup> For a concise analysis of the gateway theory, see 'What is the current evidence for cannabis as a gateway drug?' in the 2006 Australian publication *Evidence-based answers to cannabis questions: a review of the literature* (Copeland et al., 2006). Longer analysis can be found in Chapter 10 of *Cannabis use and dependence* (Hall and Pacula, 2003).

<sup>(7)</sup> The EU-Dap study (Austria, Belgium, Germany, Greece, Italy, Spain, Sweden) has reported on evaluation mechanisms for school-based drug prevention programs (Faggiano et al., 2005) — see [www.eudap.net](http://www.eudap.net). A strong introduction to the principles of school drug prevention evaluation is the Australian government's *Principles for school drug education* (2004) and its series of eight monographs, *Innovation and good practice in drug education* (2003).

<sup>(8)</sup> A long-running study in the area of general health concerns is the WHO's *Health behaviour in school-aged children*. See [www.hbsc.org/](http://www.hbsc.org/)

<sup>(9)</sup> Publications include: *Unplugged*, a teaching manual produced in the context of the EU-Dap project ([www.eudap.net](http://www.eudap.net)); in Germany, *Schule und Cannabis* (BZgA, 2004) and materials for the *Bekifft in der Schule* project (SuchtPräventionsZentrum Hamburg, 2004); in Switzerland, *Ecoles et cannabis* (OFSP, 2004); in France, *Repérage précoce de l'usage nocif de Cannabis* (INPES, 2006); in the United Kingdom, *School drug policy: a review process* (Blueprint, UK Home Office, 2004) and *Advice for teachers on delivering drug education* (Drug Education Forum, 2004). A Rowntree Foundation study of cannabis supply routes to adolescents is scheduled for 2008 (see [www.jrf.org.uk/knowledge/wip/record.asp?ID=804400](http://www.jrf.org.uk/knowledge/wip/record.asp?ID=804400)).

<sup>(10)</sup> For a discussion of screening instruments, see Beck and Legleye, this monograph.

*Education Forum's* newsblog<sup>(11)</sup> has evolved into a strong channel for practitioner information and debate in the area. Cross-border cooperation training (study visits, staff exchange) in school drug programmes is likely to benefit from funding under a current European Commission programme on drugs prevention and information<sup>(12)</sup>.

## Further reading

- Drugs in Focus No. 5: *Drug prevention in EU schools* (EMCDDA, 2002) — includes a short reading list.
- Drugs in Focus No. 10: *Drug use amongst vulnerable young people* (EMCDDA, 2004) — includes a short reading list.
- EMCDDA website on school-based universal prevention  
[www.emcdda.europa.eu/index.cfm?nnodeid=1578](http://www.emcdda.europa.eu/index.cfm?nnodeid=1578)
- ESPAD website  
[www.espad.org/](http://www.espad.org/)
- Hall, W., Pacula, R. (2003), 'Adolescent psychosocial outcomes', Chapter 11 in *Cannabis Use and Dependence: Public Health and Public Policy*, Cambridge University Press.
- McBride, N. (2005), 'The evidence base for School Drug Education Interventions', in Stockwell, T., Gruenewald, P. J., Toumbourou, J. W., Loxley, W. (eds), *Preventing harmful substance use: the evidence base for policy and practice*, John Wiley and Sons, Chichester, 101–112.
- Soole, D. W., Mazerolle, L., Rombouts, S. (2005), *Monograph No. 07: School based drug prevention: a systematic review of the effectiveness on illicit drug use*, DPMP Monograph Series, Fitzroy: Turning Point Alcohol and Drug Centre.

## Recent focused publications

### Youth detention centres

- CEPS (2004), *Análisis de la situación de los centros de protección y reforma en el ámbito de la prevención*, Centro de Estudios de Promoción Social, Madrid.
- Korf, D. J., Benschop, A., Rots, G. (2005), 'Geweld, alcohol en drugs bij jeugdige gedetineerden en school drop-outs', *Tijdschrift voor Criminologie* 47(3): 239–254.
- Vreugdenhil, C., Van den Brink, W., Wouters, L. F., Doreleijers, T. A. (2003), 'Substance use, substance use disorders, and comorbidity patterns in a representative sample of incarcerated male Dutch adolescents', *Journal of Nervous and Mental Disease* 191(6): 372–378.

### Cannabis, schools and educational performance

- Faggiano, F., Vigna-Taglianti, F., Versino, E., Zambon, A., Borraccino, A., Lemma, P. (2005), 'School-based prevention for illicit drugs use', *The Cochrane Database of Systematic Reviews* 2005, Issue 2.
- Lynskey, M., Hall, W. (2000), *Educational outcomes and adolescent cannabis use*, NSW Department of Education and Training, Sydney.

<sup>(11)</sup> <http://drugeducationforum.blogspot.com/>

<sup>(12)</sup> Ref. COD 2006/0037 Belgium;  
[http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52006PC0230\(02\):EN:NOT](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52006PC0230(02):EN:NOT)



## Patterns of cannabis use among students in Europe

Macleod, J., Oakes, R., Copello, A., Crome, I., Egger, M., Hickman, M., Oppenkowski, T., Stokes-Lampard, T., Smith, G. (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.

Plan Nacional Sobre Drogas (2004), *Encuesta estatal sobre uso de drogas en enseñanzas secundarias* [State survey on drug use in secondary schools] (ESTUDES) 1994–2004, Plan Nacional Sobre Drogas, Madrid.

Silva, A., de Deus, A. (2005), 'Comportamentos de consumo de haxixe e saúde mental em adolescentes: Estudo comparativo', *Análise Psicológica* 2(23): 151–172.

## Gateway theory

Copeland, J., Gerber, S., Swift, W. (2006), *Evidence-based answers to cannabis questions*, National Drug and Alcohol Research Centre, University of New South Wales, Sydney, 51.

Morall, A. R., McCaffrey, D. F., Paddock, S. M. (2002), 'Reassessing the marijuana gateway effect', *Addiction* 97(12): 1493–1504.



# Patterns of cannabis use among students in Europe

**Björn Hibell and Barbro Andersson**

Debate on policy and prevention for young people requires accurate data. This is the rationale that drives the European School Survey Project on Alcohol and Other Drugs (ESPAD)<sup>(13)</sup>. ESPAD collects comparable data on alcohol, tobacco and drug use among students aged 15–16 years in European countries. It also monitors trends in alcohol and drug habits among students in Europe and compares trends between countries and groups of countries.

ESPAD began in the early 1990s. So far, data have been collected three times in an increasing number of countries<sup>(14)</sup>. The first survey was done in 1995 with 26 participating countries, the second in 1999 with 30 countries and the third in 2003 with 35 countries. More than 100 000 students answered the ESPAD questionnaire in 2003. The surveys were carried out on nationally representative samples of school classes<sup>(15)</sup>. However, there were three exceptions from this. One is Germany, in which the study was limited to 6 out of 18 Bundesländer. In Turkey, data were collected in six large cities, and in Russia the survey was carried out only in Moscow. In addition to the 35 countries that participated in the 2003 data collection, the report also included data from Spain (collected in 2002) and the USA (Hibell et al., 2003).

## Awareness of cannabis: a well-known drug

Of all illicit drugs, marijuana and hashish<sup>(16)</sup> are the best known by students aged 15–16. This is true for nearly all countries and among boys as well as girls: gender differences for cannabis awareness are small. Looking at the averages of all the 35 ESPAD countries in the 2003 data collection, 92% of students admitted that they had heard of marijuana and hashish. Equally well known are cocaine and heroin (91% each). Next in terms of awareness are ecstasy (83%) and amphetamines (66%). In some countries nearly all students have heard about marijuana or hashish. This is the

<sup>(13)</sup> The ESPAD website is at [www.espad.org](http://www.espad.org)

<sup>(14)</sup> 'Country' here refers to a political entity, but not necessarily a national state. Such subnational entities as the Faroe Islands and the Isle of Man are included.

<sup>(15)</sup> A full description of survey methodology is available on the ESPAD website at [www.espad.org/method.asp](http://www.espad.org/method.asp).

<sup>(16)</sup> 'Marijuana and hashish' is used together with 'cannabis' in this chapter as 'marijuana and hashish' are the terms used in the ESPAD questionnaire. Elsewhere in the monograph, 'herbal cannabis' and 'cannabis resin' are the preferred terms.



case among 95 % or more of the students in 11 ESPAD countries. The highest figures (98–99 %) are found in the Czech Republic, France and Slovakia. The lowest proportion of students who have heard of cannabis products is found in Turkey (six cities), where 68 % of the students reported that they were aware of cannabis. In all other countries, 81 % or more of the students reported that they had heard of cannabis.

## Availability: the most available illicit drug

To measure the perceived availability of different substances the ESPAD students were asked the following question: 'How difficult do you think it would be for you to get each of the following?'. For each of the listed substances the response categories were: 'impossible', 'very difficult', 'fairly difficult', 'fairly easy', 'very easy' and 'don't know'. Besides beer, wine and spirits, the highest proportion of students answering 'very easy' and 'fairly easy' is for inhalants (41 %, in ESPAD 2003).

However, if one looks only at illegal drugs, cannabis is the drug that is perceived as most available. On average, this was the case for a little more than one-third of the students in the ESPAD countries (35 %). Other substances perceived to be readily available are tranquillisers and sedatives (21 %), followed by ecstasy (17 %). The perceived availability differs widely between countries; from 7 % in Turkey (six cities) to 60 % in Ireland. In seven countries a majority of the students answered that marijuana or hashish is 'very easy' or 'fairly easy' to obtain. These include the Czech Republic, Ireland and the United Kingdom (58–60 %), as well as Denmark, the Isle of Man, Slovenia and Switzerland (51–55 %). Hence, countries with high perceived availability of cannabis are spread throughout Europe. However, more of them are found in the north-west, including all the countries of the British Isles.

A high perceived availability is also found in the two non-ESPAD countries from which some data are available in the ESPAD report. In Spain 67 % of the students reported that marijuana or hashish was 'very easy' or 'fairly easy' to get, and in the USA the figure was even slightly higher (74 %). Turkey (six cities) showed particularly low perceived availability (at 7 %), and other countries reporting low perceived availability were Cyprus, Romania and Ukraine, at 10–13 %.

## Supply channels: mainly available in discos and bars

ESPAD students were asked where they thought that they could easily buy marijuana or hashish if they wanted it. The proportion of students reporting places of purchase varies considerably between countries. In some countries many students do not know where





to buy cannabis. The highest figures in this respect are found in Turkey (six cities) and Ukraine (80–83%), followed by Romania and Russia (69–73%). ‘Disco, bar, etc.’ is the option selected by most students. The ESPAD average was 27% in 2003, followed by ‘street, park, etc.’ (23%) and ‘home of a dealer’ (21%). In 20 countries the option ‘discos, bar, etc.’ was recognised as the easiest place to buy cannabis. ‘Streets and parks’ was the most popular option in seven countries and ‘home of a dealer’ in six.

When looking at individual countries, the highest figure for ‘discos and bars’ was found in the Czech Republic, where 55% gave this answer. Other countries with high figures (40–46%) include Belgium, Denmark, Germany (six Bundesländer), Austria and Slovakia. ‘Streets and parks’ was reported mainly from Italy (45%), followed by Belgium, Ireland, Norway, Slovenia and Switzerland (35–38%). The highest figures for ‘home of a dealer’ were found in France, Italy and the United Kingdom (39–43%). However, the highest single figure is found in the Netherlands, where 60% of the students answered ‘coffee shops’<sup>(17)</sup>. This category was included only in the Dutch and Belgian questionnaires. In Belgium it was mentioned by a far smaller number of students than in the Netherlands (29%).

The availability of drugs in schools is a sensitive issue<sup>(18)</sup>. However, on average, ‘schools’ was the least reported option for purchasing cannabis. Nonetheless, 16% of ESPAD students reported availability at school. The variation between the countries with the smallest and highest figure is large. Among Italian students, as many as 43% reported that cannabis products could easily be bought in schools. Other countries with high figures include Belgium, the Czech Republic, France and Ireland, where 30–36% gave this answer. Countries in which only 3% of the students reported that cannabis was easily available in schools include the Faroe Islands, Greenland, Turkey (six cities) and the Ukraine. Responses about places where marijuana and hashish can easily be bought are similar for both boys and girls. The most striking gender difference in the ESPAD averages is that more girls (30%) than boys (24%) answered that they can buy cannabis products at a disco or a bar. Among the boys there is no difference in the averages for the two alternatives ‘disco, bar, etc.’ (24%) and ‘street, park, etc.’ (25%).

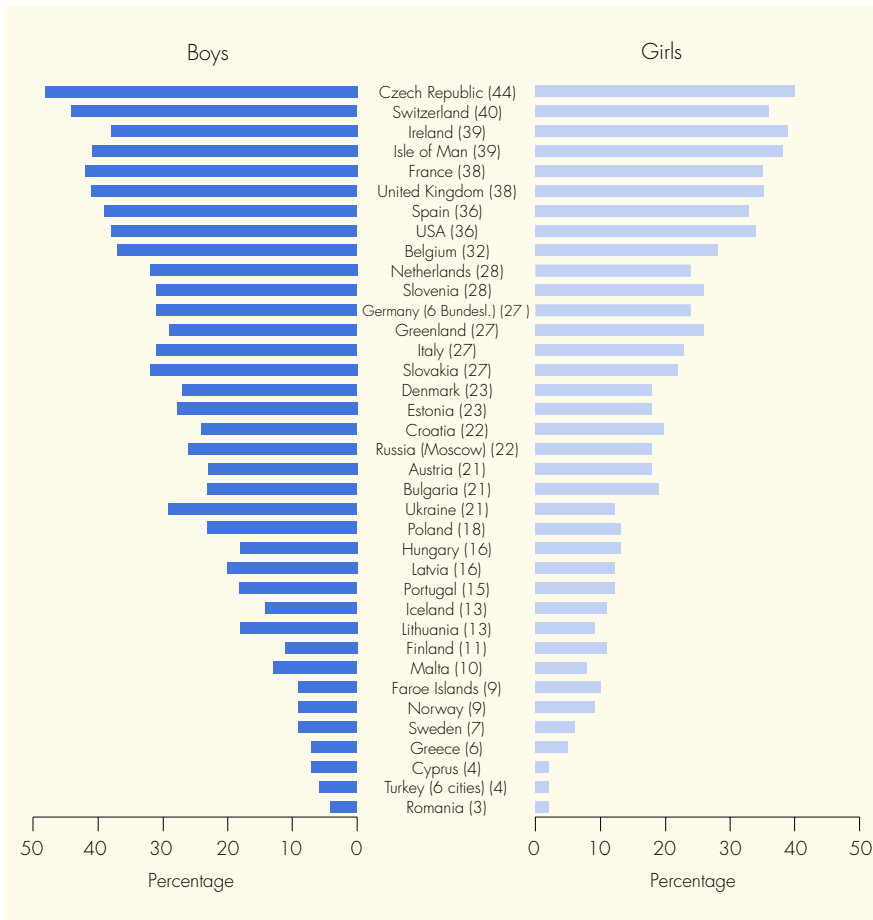
<sup>(17)</sup> ‘Coffee shop’ in this context refers to the category of shops in the Netherlands where cannabis is openly available to those aged 18 and above (see Korf, this monograph).

<sup>(18)</sup> With regard to legislative approaches to cannabis possession, a number of countries include references to cannabis use which places minors at risk. See the ELDD map of European legislation on cannabis possession at: <http://eldd.emcdda.europa.eu/index.cfm?nnodeid=5769>

## Lifetime prevalence: the most widely used illicit drug, yet large differences between countries

Cannabis is the most commonly used of all the illicit drugs<sup>(19)</sup> (Figure 1). In 2003 the ESPAD average for lifetime cannabis prevalence was 21%. However, the proportion of students who have tried cannabis varies from 3 to 44% between countries.

Figure 1: Lifetime experience of marijuana or hashish. Percentages among boys and girls, 2003

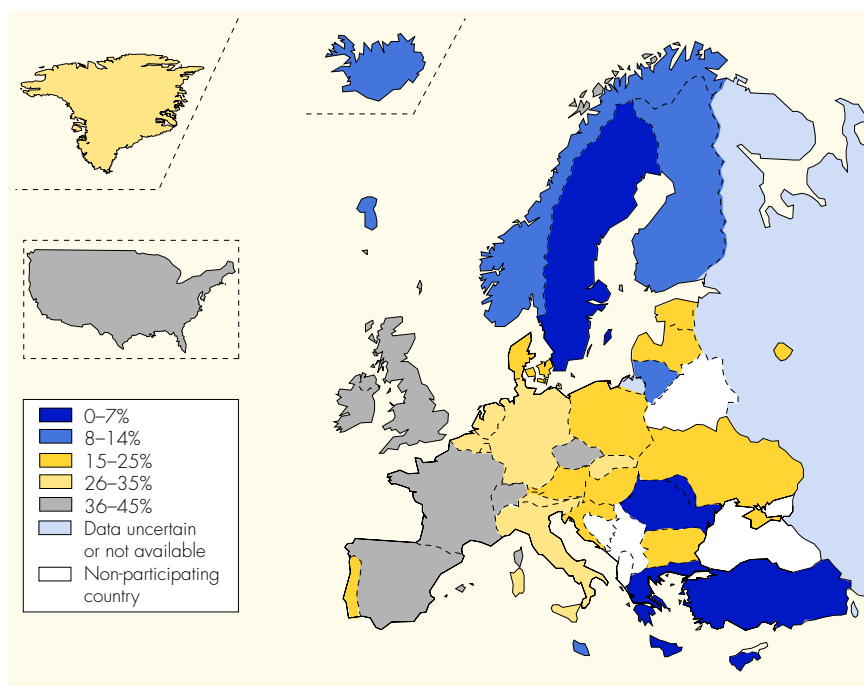


Note: Values within brackets refer to all students. Germany and Turkey — limited geographical coverage. Spain and USA — limited comparability.

<sup>(19)</sup> Far behind cannabis comes ecstasy, which was mentioned on average by 3% of students. The highest prevalence rate for any drug other than cannabis in any single country is 8%: 8% of Czech students reported use of ecstasy as well as of magic mushrooms.

Students in the Czech Republic reported the highest cannabis use, at 44%, yet high prevalence rates were also reported from Switzerland (40%), Ireland and the Isle of Man (39% each), France and the United Kingdom (38% each). Other countries where more than a quarter of students have used cannabis include Belgium (32%), the Netherlands and Slovenia (28% each), Germany (six Bundesländer), Greenland, Italy and Slovakia (27% each). The lowest levels of cannabis use are reported from Romania (3%), Cyprus, Turkey (six cities) (4% each), Greece (6%) and Sweden (7%). Low prevalence rates are also found in the Faroe Islands, Norway (9% each) and Finland (10%). Data from the non-ESPAD countries Spain and the USA reveal that 36% of students in both countries had ever used cannabis (Figure 2).

**Figure 2:** Lifetime experience of marijuana or hashish. Percentages among all students, 2003



Note: Germany and Turkey — limited geographical coverage. Spain and USA — limited comparability.

## Recent use of cannabis (last year and last month prevalence) — between 2 and 36%

In adult populations regular drug use can be measured in different ways. One of these is last month prevalence (drug use in the last 30 days). In many cases this indicates not only recent use but also more regular consumption. However, for a 15- or 16-year-old student, last month prevalence may very well be identical with first use. A better way of defining regular use is to ask young people to declare frequency information for last year (use in the last 12 months) and last month prevalence. For example, to measure whether a student has used cannabis '10 times or more during the last 12 months' and 'three times or more during the last 30 days' <sup>(20)</sup>.

In the current absence of explicit frequency-of-use data, one way to build a picture of recent use is to compare the figures for last year prevalence with those for last month prevalence.

As mentioned earlier, an average of 21% of ESPAD students reported ever-in-lifetime use of cannabis. By comparison, 16% of ESPAD students reported last year prevalence and 9% last month prevalence. For other drugs, the highest figure for any other drug was 2% for the last year prevalence for ecstasy and 1% for last month prevalence of amphetamines, ecstasy and magic mushrooms. Thus, there is a broad overlap between average ever-in-lifetime use (21%) and last year prevalence (16%).

The Czech Republic reported the highest last year prevalence (36%), while other high-prevalence countries include the Isle of Man (34%), France, Ireland, Switzerland and the United Kingdom (31% each). Countries where very few students have used cannabis during the last 12 months are to a large extent the same that reported low lifetime prevalence rates. Thus, the smallest number of students reporting this behaviour are found in Romania (2%), Cyprus, Turkey (six cities) (3% each), the Faroe Islands (4%), Greece and Sweden (5% each). In the non-ESPAD country, Spain, 32% of the students had used cannabis during the last 12 months. The corresponding value for the USA is 28%.

Not unexpectedly, the high- and low-prevalence countries with regard to last month prevalence are about the same as for last year prevalence. Countries with the highest last month prevalence include France (22%), the Isle of Man (21%), Switzerland, the United Kingdom (20% each) and the Czech Republic (19%). Other countries with relatively high rates are Belgium, Ireland (17% each) and Italy (15%). In some countries, however, very few report last month prevalence. The six countries with the lowest figures

<sup>(20)</sup> This information is available in the ESPAD national datasets, but at the time of writing it was not available for comparative analysis.



are the Faroe Islands, Romania, Sweden (1% each), Cyprus, Greece and Turkey (six cities) (2% each). In Spain and the USA last month prevalence rates are 23% and 17% respectively.

## Gender differences?

There is a clear gender gap in cannabis prevalence<sup>(21)</sup>, with boys generally more likely to have tried cannabis, or to have recently used cannabis, than girls.

For lifetime prevalence, with one exception (Ireland), in no country are there more girls than boys who have tried cannabis. Boys are in the majority in about two-thirds of the ESPAD countries (see Figure 1). However, in some countries there are no strong gender differences. Few differences in gender can be seen in the British Isles and among the Nordic countries, including the Faroe Islands, Finland, Greenland, Iceland, Ireland, the Isle of Man, Norway and Sweden. Greece is also an exceptional southern country, reporting near-equal lifetime prevalence for girls and boys. In the Czech Republic, Denmark, Estonia, Ireland, Latvia, Poland, Slovakia and Norway the gender gap has narrowed in successive surveys. It may also be noted that countries with near-equal prevalence between genders relate to both high- and low-prevalence countries.

More boys (19%) than girls (14%) on average report last year use of cannabis. This pattern applies to the majority of reporting countries, and applies to both high-prevalence countries (e.g. Czech Republic, France, the United Kingdom) and low-prevalence countries (e.g. Cyprus and Turkey). The largest gender gap in last year prevalence is found in the Ukraine, with 18% for boys and 6% for girls. Large gender divides in last year prevalence are also reported by Belgium (32% boys, 22% girls) and Slovakia (24% boys, 14% girls).

For last month prevalence, on average 11% of boys and 7% of girls reported cannabis use in the last 30 days. The pattern is reflected in nearly half of the countries. There is no real geographical pattern in the gender distribution.

## The typical debut drug

Cannabis is the illegal substance most commonly reported as a debut drug among both boys and girls. On average, 18% of all ESPAD students report that cannabis was the first illegal substance they have tried, corresponding to about 80% of all students who

<sup>(21)</sup> Gender issues in drug use were explored in the EMCDDA selected issue, *A gender perspective on drug use and responding to drug problems* (EMCDDA, 2006), available at: <http://issues06.emcdda.europa.eu/en/page013-en.html>



## Patterns of cannabis use among students in Europe

have tried any illicit drug. Cannabis is the leading debut illegal drug in all but three ESPAD countries. Second to cannabis, but with much lower figures, are tranquillisers or sedatives, reported by 2% of all students, about 9% of students who report having tried any illicit drug.

### Early onset

If one excludes inhalants, which are not defined as an illicit drug, cannabis is the most common drug that is used at an early age. Of all ESPAD students, 4% report that they were 13 years or younger when they tried cannabis for the first time ('early onset')<sup>(22)</sup>. The figures for early onset vary between countries, from 0% in Romania to 13% in the United Kingdom. Examples of other countries with high early onset figures include the Isle of Man (12%) and Switzerland (11%). These figures are similar to those reported in the USA (10%). Very small gender differences appear when it comes to early onset. In the very few cases where a gender gap exists, figures are slightly higher for boys. The largest gender difference is found in Belgium, where 10% of boys and 5% of girls report trying cannabis at age 13 or younger.

### Increased use in many countries

Between the first ESPAD data collection in 1995 and the second in 1999, a majority of countries reported an increase in lifetime cannabis prevalence. Many countries also showed continuing increases between 1999 and 2003.

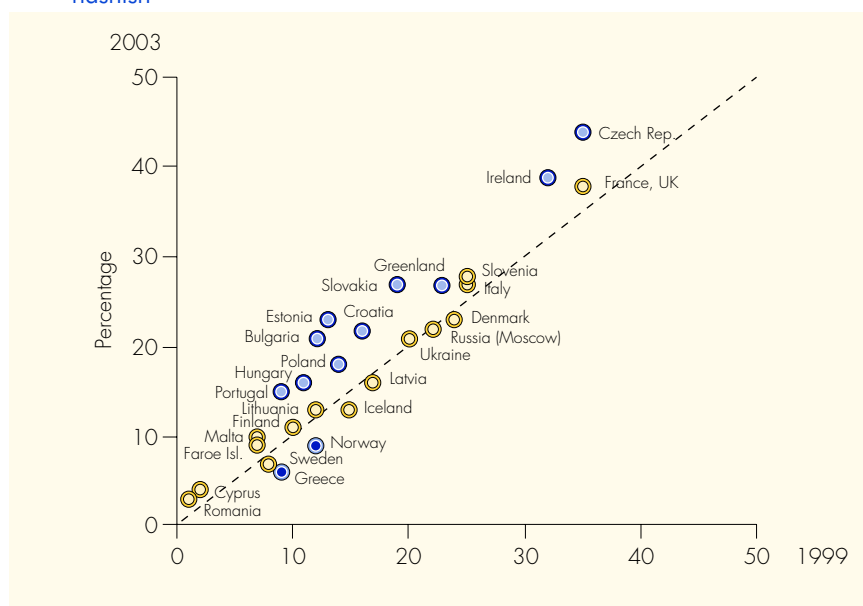
Of the ESPAD countries that participated in 1995, 21 provided comparable data from the second data collection. Two-thirds of these countries reported higher lifetime cannabis prevalence in 1999. These countries were spread geographically across Europe and include countries with high lifetime prevalence (e.g. the Czech Republic, with 35% in 1999) and low lifetime prevalence (e.g. Finland, with 10%, and Hungary, with 11% in 1999). Three countries reported a decline in lifetime cannabis prevalence between 1999 and 1995. Two of these were the top countries in both 1995 and 1999: the United Kingdom (35% in 1999) and Ireland (32% in 1999). The third country was a low prevalence country: the Faroe Islands (7% in 1999).

Six countries reported minor decreases in lifetime prevalence between 1999 and 2003: Denmark (23% = -1%), Greece (6% = -3%), Sweden (7% = -1%), Norway (9% = -3%), Iceland (13% = -2%) and Latvia (16% = -1%) (Figure 3). In a majority of the countries that participated in both surveys (18 out of 28) the figures were about the same in the two data collections. However, lifetime prevalence increased in absolute percentage

<sup>(22)</sup> For further discussion of early initiation into cannabis use in Europe, see Kokkevi et al. (2006).



**Figure 3: Changes between 1999 and 2003 in lifetime prevalence of marijuana or hashish**



Note: Countries above the line have increased prevalence rates, and countries below have decreased. All students.

points by over 4% in 10 countries: Czech Republic (44% = +9%), Ireland (39% = +7%), France (38% = +4%), Slovakia (27% = +8%), Estonia (23% = +10%), Croatia (22% = +8%), Bulgaria (21% = +9%), Poland (18% = +4%), Portugal (15% = +6%), Hungary (16% = +16%).

Of the 21 countries that have comparable data from all three data collections, six show an increased trend through all three data collections. These are Croatia, Czech Republic, Estonia, Hungary, Poland and Slovakia: all Eastern European countries. In 1995 some of these countries were among those with lowest prevalence (e.g. Hungary with 4% and Estonia with 7%). In 2003 one of these was at the top of all participating countries (Czech Republic with 44%), three others are in the upper half and two are around the middle (Hungary with 16% and Poland with 18%)<sup>(23)</sup>. The number of countries which showed an increase in prevalence between 1999 and 2003 are about the same both for last year prevalence (nine countries) and for lifetime prevalence (10 countries). However, relatively few countries reported an increase in last month prevalence (three countries). In nearly all countries the trends over time have been about the same among boys and girls.

<sup>(23)</sup> For a more detailed analysis of cannabis in these countries, see Moskalewicz et al., this monograph.

## Increased perceived availability in many countries

Perceived availability of cannabis <sup>(24)</sup> increased strongly compared with other substances from 1999 to 2003, from an average of 29–35%. Changes in perceived availability are also very similar for boys and girls. The number of countries in which perceived availability increased for other drugs is much smaller, and averages were about the same in 2003 as in 1999.

Increases in cannabis perceived availability were reported in nearly half of the countries with available information (13 out of 28). These countries were broadly concentrated in the eastern parts of Europe (10 out of these 13 countries). Increases were reported in countries with low as well as high perceived availability; for example, Romania (11%) and the Czech Republic (58%). Only three countries — Denmark (52%), Greece (20%) and Norway (26%) — reported lower perceived availability of cannabis in 2003 than in 1999.

In seven countries perceived availability of cannabis increased in all three data collections from 1995 to 2003 (Croatia, the Czech Republic, Estonia, Lithuania, Poland, Slovakia and Slovenia). All are Eastern European countries, and five of them are among the six countries in which the lifetime prevalence increased in 1995, 1999 and 2003 (Croatia, the Czech Republic, Estonia, Poland, Slovakia).

## Consumption and perceived availability — strongly correlated

ESPAD uses, to some extent, the same questions that are used in the *Monitoring the Future* <sup>(25)</sup> studies in the USA, where they have a long series for grade 12 students (17–18 years old), dating back to the 1970s (Johnston et al., 2005). In the USA, it is evident that there have been changes in cannabis use over time. However, during the whole period the perceived availability seems to have remained relatively stable among 12th graders.

Information about students in grade 10 (15–16 years old), i.e. students of about the same age as the ESPAD target group, is available in the US studies only from 1991. The use of marijuana increased in this group between 1991 and 1997, then levelled off, before decreasing from 2001 onwards. For the whole period the availability trend has followed the use trend very closely.

<sup>(24)</sup> Defined as the share of students reporting that marijuana or hashish were 'very easy' or 'fairly easy' to obtain.

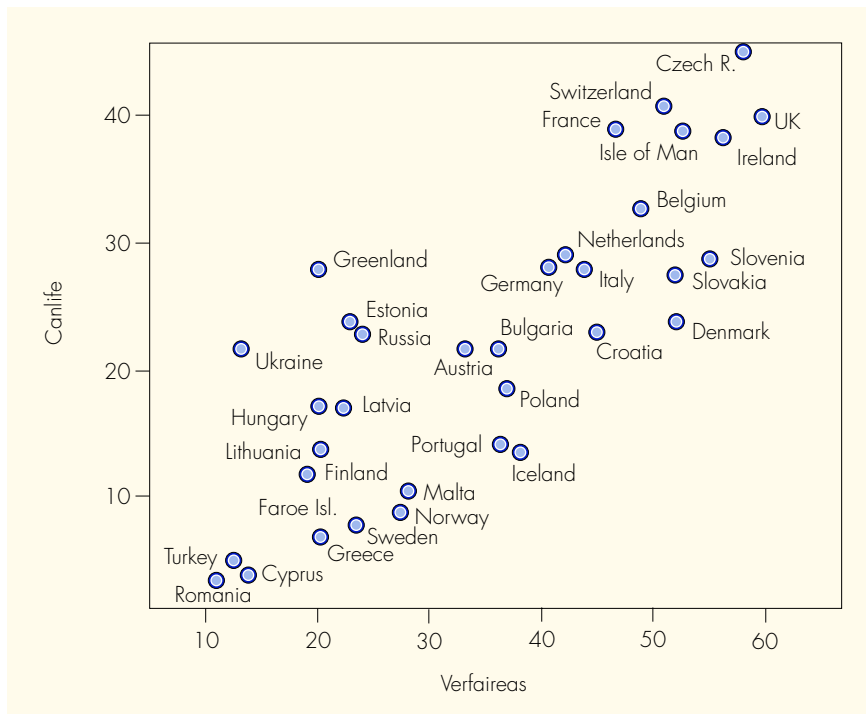
<sup>(25)</sup> The website of the Monitoring the Future Study is [www.monitoringthefuture.org/](http://www.monitoringthefuture.org/)



As mentioned in the previous section, in five out of the six ESPAD countries in which the lifetime prevalence for cannabis increased consistently in 1995, 1999 and 2003, perceived availability also increased. This indicates that there is a strong relationship in the ESPAD countries between changes in the level of consumption in a country and changes in the perceived availability of cannabis. This relationship is found in 2003 when one compares the proportion of students in different ESPAD countries who have ever used cannabis and the proportion of all students who perceive marijuana and hashish 'very easy' or 'fairly easy' to obtain (Figure 4). It is obvious that there is a strong positive relationship between lifetime prevalence of cannabis and perceived availability ( $r_{xy} = 0.85$ ,  $r_{\text{rank}} = 0.85$ ).

These results indicate that use of cannabis and perceived availability are highly correlated among 15- to 16-year-old students in Europe, as well as in the USA. However, this is not the case among 17- to 18-year-old American students. Possible explanations for this could include age (12th graders are about two years older than the ESPAD target group), degree of availability (in 2003, 87% among the 12th graders,

**Figure 4:** Correlation between lifetime use of cannabis (Canlife) and the proportion of students answering that cannabis is very/fairly easy to obtain (Verfaireas) ( $r_{xy} = 0.85$ ,  $r_{\text{rank}} = 0.85$ )



Source: ESPAD data from 2003.



74% among 10th graders, compared with 35% on average among the ESPAD students, with a range from 7 to 60%); the degree of stability of perceived availability (this has changed among the 15- to 16-year-old students, while it has been stable among American 12th graders). A conclusion from this is that changes in the availability of cannabis are linked to changes in consumption among 15- to 16-year-old students, even though any direct causal link needs to take into account other psychosocial factors.

## Consumption and risk perception — strongly correlated

The *Monitoring the Future* study in the USA has found a strong relationship between changes in the perceived risk of cannabis use and changes in consumption levels. This has been interpreted as reflecting a causal connection (Johnston et al., 2005). With only three data collections within ESPAD, a similar analysis of the possible influences of changes over time is difficult. However, a comparison between the countries in the 2003 data collection shows a very strong relationship between the risk perception of cannabis and consumption level. The correlation at the country level between the lifetime prevalence rates of cannabis use and the proportion of students who indicated that there is a 'great risk' related to using it once or twice was strongly negative ( $r_{xy} = -0.76$ ,  $r_{\text{rank}} = -0.79$ ). This indicates that at the country level there is a strong negative relationship between risk perception and consumption levels, i.e. the lower the risk perception, the higher the consumption levels.

## Correlates of adolescent cannabis use

The research literature offers numerous studies of psychosocial factors that correlate with adolescent cannabis use<sup>(26)</sup>. However, findings are mixed or inconsistent, and focus on a single country or restricted group of countries, with different methodological aspects influencing the results. Moreover, such statistical associations are far from deterministic: there is hardly any correlate of adolescent substance use that has not been found to be non-significant in some study.

As ESPAD data collections in the different countries are carried out in a standardised way, the ESPAD project includes data that may be more suitable for cross-cultural comparison. One of the chapters in the latest ESPAD report includes correlates at the individual level from nearly all ESPAD countries (Hibell et al., 2004: 194–199). The summary below provides an overview of correlates for cannabis. Some caveats are

<sup>(26)</sup> A review of psychosocial correlates with ESPAD data from Bulgaria, Croatia, Greece, Romania, Slovenia and United Kingdom was recently carried out (Kokkevi et al., 2007). Another recent study analysed correlates of adolescent cannabis use and consumer expenditure (PCE), unemployment and peer factors in 31 countries (ter Bogt et al., 2006).



required, however. ESPAD is based on a clustered not random sample (samples of classes, with classes as the sampling unit), which complicates statistical calculations. Yet, for pragmatic reasons standard *t*-tests have been used in this section, based on the understanding that these tests of statistical significance are likely to overestimate any correlates: the results must be interpreted as offering useful general guidelines only.

The lifetime use of cannabis was correlated with parents' education <sup>(27)</sup> (father's and mother's education separately), family structure (single parents and one parent together with a step-parent) <sup>(28)</sup>, economic situation (how well-off the students thought their family is compared with other families), perceived parental control (the students' opinions concerning the extent to which their parents know where they spend Saturday nights), truancy (the number of days of school skipped during the last 30 days) and siblings' use of cannabis (Table 1).

## References

- ter Bogt, T., Schmid, H., Saoirse, N. G., Fotiou, A., Vollebergh, W. (2006), 'Economic and cultural correlates of cannabis use among mid-adolescents in 31 countries', *Addiction* 101: 241–251.
- Hibell, B., Andersson, B., Bjarnason, T., Ahlström, S., Balakireva, O., Kokkevi, A., Morgan, M. (2003), *The ESPAD report 2003 — alcohol and other drug use among students in 35 European countries*. The Swedish Council for Information on Alcohol and Other Drugs, Stockholm, Sweden.
- Johnston, L., O'Malley, P., Bachman, J., Schalenberg, J. (2005), *Monitoring the future. National survey results on drug use, 1975–2004, volume 1: secondary school students*. National Institutes on Drug Abuse, Bethesda, Maryland, USA.
- Kokkevi, A., Saoirse, N. G., Spyropoulou, M., Risk Behaviour Focus Group of the HBSC (2006), 'Early initiation of cannabis use: a cross-national European perspective', *Journal of Adolescent Health* 39: 712–719.
- Kokkevi, A., Richardson, C., Florescu, S., Kuzman, M., Stergar, E. (2007), 'Psychosocial correlates of substance use in adolescence: a cross-national study in six European countries', *Drug and Alcohol Dependence* 86: 67–74.
- Macleod, J., Oakes, R., Copello, A., Crome, I., Egger, M., Hickman, M., Oppenkowski, T., Stokes-Lampard, H., Davey Smith, G. (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: 1579–1588.

<sup>(27)</sup> Parental education with the options of: (i) primary school or less; (ii) some secondary; (iii) completed secondary; (iv) some college/university; (v) completed college university; and (vi) don't know.

<sup>(28)</sup> Students are asked who they share a household with. Options are: (i) I live alone; (ii) father; (iii) stepfather; (iv) mother (stepmother); (v) brothers/sisters; (vi) grandparents; (vii) other relatives; and (viii) non-relatives.

Table 1: Lifetime use of cannabis correlated with family variables

	Father's education	Mother's education	Poor family economy	Single parent	One parent + step-parent	Poor perceived parental control	Truancy	Sibling's perceived cannabis use
Belgium	0	0	0	+	+	+	+	+
Bulgaria	+	+	0	0	0	+	+	+
Croatia	+	+	0	+	0	+	+	+
Czech Republic	-	-	0	+	+	+	+	+
Denmark	0	0	0	+	+	+	+	+
Germany (six Bundesländer)	+	+	-	+	+	+	+	+
Estonia	0	0	-	0	+	+	+	+
Ireland	0	0	0	0	NA	+	+	+
Greece	0	+	0	0	+	+	+	+
Faroe Islands	0	0	0	0	NA	+	+	+
Finland	0	0	0	+	+	+	+	+
France	NA	NA	NA	+	+	NA	+	NA
Iceland	0	0	+	+	+	+	+	+
Italy	0	0	-	+	+	+	+	+
Greenland	0	0	-	+	+	0	+	+
Iceland	0	0	+	+	+	+	+	+
Isle of Man	-	0	0	0	+	+	+	+
Cyprus	0	+	0	NA	NA	+	+	+
Lithuania	-	0	0	0	0	+	+	+
Hungary	0	0	0	+	+	+	+	+
Malta	+	+	0	+	+	+	+	+
Netherlands	0	+	-	+	+	+	+	+
Norway	0	-	0	+	+	+	+	+

Austria	+	+	0	+	+	+	+	+
Romania	+	+	0	0	0	+	+	+
Russia (Moscow)	0	0	–	+	+	+	+	+
Slovenia	+	+	0	0	0	+	+	+
Slovakia	+	0	0	+	+	+	+	+
Sweden	0	0	0	+	+	+	+	+
Switzerland	+	+	0	+	+	+	+	+
Turkey (six cities)	0	0	–	+	0	+	+	+
Ukraine	0	0	0	+	+	+	+	+
United Kingdom	–	–	+	+	+	+	+	+
Number of positively indicated correlations	9	11	2	22	23	30	32	31
Number of non-significant correlations	17	16	22	9	6	1	0	0
Number of negatively indicated correlations	4	3	7	0	0	0	0	0

#### Notes

0, the correlation is not significant.

NA, data not available.

Limited or no correlations: The correlations are different for the different variables. In the majority of the countries (16 or 17) *parental education* is not significantly correlated with drug use. However, there is a significant positive correlation in 9–11 countries, and three or four countries have negative associations. The picture is similar for *poor family economy*, even though the number of countries without any significant correlation (22) is even higher than for parental education. Where associations are found, there are more countries with negative (seven) than positive (two) significant correlations.

Moderate correlations: *Poor family structure* is positively correlated with cannabis use in a large majority of the countries. This was the case in 22 to 23 countries for the single-parent variable, as well as for the case when one of the parents lives together with a step-parent. In all other countries the relationship was non-significant.

High correlations: The picture is even clearer when it comes to perceived parental control, truancy and siblings' cannabis use. In all countries but one (30) there is a positive association between *poor perceived parental control* and cannabis use, that is, the less the parents know where their children spend Saturday nights the higher the proportion of the children that have tried cannabis. In all 32 countries with available information there is a positive correlation between *truancy* and cannabis use. This means that the more days a student has skipped school during the last 30 days, the higher the probability that he/she has used cannabis. Another factor for which the correlation is the same in all analysed countries is *perceived sibling's use of cannabis*. In all 31 countries there is a positive correlation between perceived sibling's use of cannabis and the student's own use. In other words, having a sibling that uses cannabis increases the probability for a student to have used this drug.





## Chapter 4

# Cannabis in the context of polydrug use: results from the Dutch National School Survey

**Keywords:** adolescent prevalence – alcohol – cannabis – epidemiology – Europe – polydrug use – schools – survey – tobacco

### Setting the context

Polydrug consumption, the consumption of more than one drug, is one of the great confounders of our knowledge of drug use. A vast array of psychoactive substances, both legal and illegal, are consumed in Europe today: alcohol, tobacco, prescription drugs, ecstasy, inhalants, cocaine, amphetamines, heroin, hallucinogens, not to mention the long list of synthetic substances monitored by the EMCDDA's early warning system (GBL, TMA, 4-MTA, MDD, etc.). This wide range of substances means that, in practice, drug use can come in many forms.

Despite the puzzle it represents, examination of polydrug consumption is rewarding, providing valuable insights into the context of drug use and complementary risk patterns. People who consume psychoactive substances commonly do not restrict themselves to a single drug (i.e. cocaine or heroin alone). Nonetheless, there are pairings and combinations that often go hand in hand. This is particularly the case with cannabis, which is very often combined with tobacco, and is commonly consumed together with alcohol, and, less commonly, other illicit substances. In terms of drug use among young people, studies looking at contexts such as schools, youth detention centres and recreational nightlife settings have sharpened our insight into polydrug use.

This chapter outlines two of the key concepts in defining polydrug use: 'concurrent use', i.e. use of multiple substances within a defined time period, and 'simultaneous use', i.e. use of multiple substances on the same occasion. It also looks at means of 'clustering', a technique that helps us to identify common pairings or clusters of drugs used in a given population, and to build a typology of different groups of drug users. Such typologies are useful in enabling practitioners, teachers and parents to identify 'at-risk' groups.



School surveys provide a useful opportunity for examining drug use across the population. This chapter looks in particular at school students aged 12–16 years in the Netherlands. This age group encompasses younger students than in the most exhaustive European school survey, ESPAD, which surveys students aged 15–16 years (see Hibell, this monograph). Using a younger sample for drugs surveys is interesting. Teenagers are at a stage in life when many will encounter drugs for the first time, with some of them beginning to drink alcohol or smoke in their early teens. And, as with many other aspects of life, experiences at school, even if they do not determine or accurately predict later behaviour, strongly influence drug-using behaviour in adult life.

So, while this chapter provides a national case study of polydrug consumption within a restricted sample, its insights will have wider relevance. They are particularly valuable for those attempting to decipher the many complexities of polydrug use, with a view to informing intervention.

## Further reading

- Amengual Munar, M. (2000), 'Enfoques preventivos del uso y abuso de cannabis y problemas asociados', in Bobes, J., Calafat, A. (eds), *Monografía Cannabis*, Plan Nacional Sobre Drogas, Madrid.
- Collins, R. L., Ellickson, P. L., Bell, R. M. (1988), 'Simultaneous polydrug use among teens: prevalence and predictors', *Journal of Substance Abuse* 10: 233–253.
- Copeland, J. (2001), 'Clinical profile of participants in a brief intervention program for cannabis use disorder', *Journal of Substance Abuse Treatment* 20(1): 45–52.
- Duffy, M. Schafer, N., Coomber, R., O'Connell, L., Turnbull, P. (2008), *Cannabis supply and young people: 'It's a social thing'*, Joseph Rowntree Foundation, York.
- EMCDDA (2006), *Annual report 2006, Selected issue 3: a gender perspective on drug use and responding to drug problems*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- Harrison, L., Erickson, G., Korf, D., Brochu, S., Benschop, A. (2007), 'How much for a dime bag? An exploration of youth drug markets', *Drug and Alcohol Dependence* 90(Suppl. 1): S27–S39.
- Siliquini, R., Faggiano, F., Geninatti, S., Versino, E., Mitola, B., Ippolito, R. (2001), 'Patterns of drug use among young men in Piedmont (Italy)', *Drug and Alcohol Dependence* 64: 329–335.



# Cannabis in the context of polydrug use: results from the Dutch National School Survey

Karin Monshouwer, Filip Smit and Jacqueline Verdurmen

## Summary

A survey was conducted to describe the position of cannabis in the wider context of polydrug use among secondary school juniors (aged 12–16 years) in the Netherlands. Data were derived from the 1999 sample of the Dutch National School Survey on Substance Use. Studied substances were alcohol, tobacco, cannabis, ecstasy, amphetamines, opiates and cocaine. Among the total student population, 56.7% use one or more substances, of whom 41.8% are polydrug users in that they used more than one substance during the previous four weeks. Projected to a Dutch student population of 1 million, 237 000 are polydrug users, of whom 142 000 use only alcohol and tobacco, 65 000 combine alcohol or tobacco with cannabis, and 20 000 combine alcohol, tobacco or cannabis with at least one hard drug such as ecstasy, cocaine, amphetamines or heroin. The risk of polydrug use increases with age. Prevalence rates were highest among ethnic Dutch students, very low among Moroccan students and high at the lower educational levels. By comparison with girls, boys had a specific risk of becoming the type of polydrug user using soft or hard drugs. The position of cannabis use in the context of polydrug use is an ambiguous one. On the one hand, cannabis use is more strongly associated with drinking and smoking than with the use of hard drugs. On the other hand, among cannabis users, higher prevalence rates of hard drug use can be observed than is the case among drinkers and smokers.

## Introduction

Although it has been well established that cannabis and other substance use often co-occur, relatively few studies have focused on polydrug use and its relation to cannabis use. In the Netherlands, for example, reliable epidemiological figures about polydrug use are rare (NDM, 2001).

Yet polydrug use is important: using combinations of drugs can have often unpredictable risks through additive and synergetic effects (Earlywine and Newcomb, 1997; Leccese et al., 2000). Studies have shown that the combined use of substances increases the likelihood of both physical and psychological damage (Feigelman et al., 1998). For

example, Stronski et al. (2000) found that cannabis users who were also using other illicit drugs were at higher risk for risk-related behaviour (for example, antisocial behaviour and accidents) than those who were not using other drugs in addition to cannabis. Furthermore, in 2003 in the Netherlands, 40% of the newly registered individuals in addiction care had a problem with more than one addictive substance other than tobacco use (IVV, 2001). Of all clients reporting a cannabis use disorder as their primary problem, 38% also had a secondary substance use problem, most commonly alcohol (reported at 18% of all primary cannabis clients).

However, the number of people in treatment does not provide a strong picture of polydrug use in the general population. With regard to polydrug use, secondary school students form a group that warrants special interest. Most substance use is initiated in adolescence and students can easily be targeted with preventive interventions. In addition, this group can be regarded as a new generation, in which the contours of what lies ahead, in an epidemiological sense, start to appear. After all, polydrug use during the teenage years is a significant predictor of polydrug use in adult life (Galaif and Newcomb, 1999; Jessor, 1987).

For these reasons, in our study, we sought answers to the following:

- What polydrug use patterns can be discerned among secondary school students, and where does cannabis fit in?
- What types of user groups can be defined among students, and how many students can be found in each of these user groups?
- What are the corresponding social and demographic risk profiles?

This chapter is based on the work of Smit et al. (2002a), which appeared in *Drugs, Education, Prevention and Policy* (DEPP). The editorial board of DEPP kindly gave permission to make use of the original work.

## Method

### Sample, data collection and response

Data were used from the fifth wave of the National School Survey on Substance Use, conducted in 1999 (De Zwart et al., 2000). The school survey methodology has been fully described elsewhere (Smit et al., 2002b). In short, a questionnaire was administered in classes, which included questions on substance use during the previous four weeks. The non-response rate was low: on average, 4.8% of students in each class were not reached due to illness, truancy or other reasons, and only 0.07% of the students refused participation. Analysis was limited to secondary school students between the age of 12 and 16 years, an age at which school attendance is compulsory ( $n = 6\,236$ ). In this way,



insight was gained into a broad group of students attending all different school types and we avoid overrepresentation of students older than 16, who mostly attend school types of a higher, pre-university level.

## Polydrug use

In the literature, two forms of polydrug use are distinguished: concurrent and simultaneous polydrug use. Concurrent polydrug use is the use of at least two substances in the same time period, for instance the previous four weeks. A specific form of concurrent polydrug use is simultaneous polydrug use, in which a user combines two or more substances on the same occasion (see Earlywine and Newcomb, 1997; Collins et al., 1998). In this study, polydrug use was operationalised as the use of two or more substances by one person in the four weeks preceding the study, i.e. 'concurrent polydrug use'. According to this definition, polydrug users can also be people who use several substances on the same occasion and who therefore may be called 'simultaneous polydrug users'. In this study we included the following substances: alcohol, tobacco, cannabis, ecstasy, amphetamines, heroin and cocaine.

## Demographics

The following demographic characteristics were included: gender, age, level of urbanisation, school type (first class secondary school, lower vocational, lower general, higher general and pre-university education) and ethnicity. The five levels of urbanisation used by the central bureau of statistics in the Netherlands (Statistics Netherlands) were collapsed into two categories: the index category 'very urbanised', i.e. more than 2500 addresses per km<sup>2</sup>, and a reference category, 'all other urbanisation levels'. This division was made because in a number of studies (e.g. Monshouwer et al., 2003) we concluded that 'very urbanised' living environments are significantly associated with substance use, and the same association has also been found by others (Abraham et al., 1999). Ethnicity was divided into six categories: Dutch (reference category), Caribbean, Surinamese, Moroccan, Turkish and others. Following the rules of Statistics Netherlands, a person was regarded, for example, as Surinamese if he or she was born in Surinam, or if at least one of the parents was born in Surinam. With the aid of these demographic variables, the recognition of the group with an increased risk of polydrug use can be enhanced. This information can be useful for targeting preventative interventions.

## Analysis

In order to assess the representativeness of the sample, we compared the multivariate distribution over the variables of school type, school year and level of urbanisation in the sample with the corresponding distribution in the Dutch student population, as described



by Statistics Netherlands. The small differences between sample and population were corrected by weighting, after which the distribution in the sample was exactly the same as in the population.

It is of note that we obtained a cluster sample, as all students from the same class were drawn as a single group. This method is not without consequences. Students from the same class share several characteristics, such as having the same teacher, or being exposed to the same educational system. This results in dependence between the observations and this, in turn, can influence the standard errors, confidence intervals and *P*-values. Therefore, robust variance-related statistics were obtained, using the first-order Taylor-series linearisation method.

A number of substance use variables suffered from non-response to items. The item non-response rate was highest for alcohol, at 6.1 %, followed by cannabis, at 2.2 %. For the remaining substances, item non-response was less than 1 %. The missing values were imputed with the help of a regression model, using the demographic variables as predictors. Under the regression model, the most likely values were calculated and used to replace the missing values. Tables 1, 2 and 3 include only percentages. In Table 4 odds ratios (ORs) are presented, obtained by multiple logistic regression analysis. The interdependence between the use of the various substances was studied with 'homogeneity analysis through alternating least squares' (HOMALS; cf. Van de Geer, 1993; Van der Heijden et al., 1999). HOMALS is a multivariate scaling technique, similar to factor analysis, but applicable to nominal variables. HOMALS can be used for finding homogeneous clusters of substance users who resemble each other (see Figure 1). In this chapter only, the statistics after imputation, weighing and correction for cluster effects are presented.

For the HOMALS analysis SPSS version 8.0 was used (SPSS Inc., 1988). For all other analyses, Stata version 6.0 was used (StataCorp, 1997).

## Results

### Demographic characteristics

Of the total student population, 76.2% were Dutch, 1.3% Caribbean, 4.7% Surinamese, 4.1% Moroccan, 2.8% Turkish and the remaining 10.9% were of another, mainly European or Asian, origin. The average age was 14 years (range 12–16 years). Of the students, 30.3% attended the first year of secondary school, 25.3% lower vocational, 19.6% lower general, 12.8% higher general and 12.1% pre-university education. A minority (15.1%) of the students lived in densely urbanised areas.



## Prevalence of substance use

Table 1 shows the four-week prevalence rates of use of the different substances, by gender. The prevalence rates were highest for the use of alcohol and tobacco, followed immediately by the use of cannabis. The prevalence rates of the use of hard drugs were relatively low. Cocaine ranked at a similar level to ecstasy and amphetamines. Heroin occupied the last place.

Table 2 shows the top 10 of the most frequently occurring patterns of use, divided according to non-use, mono- and polydrug use. Of the 12- to 16-year-olds, 43.3% had used no substance during the previous four weeks, 28.2% had used only alcohol and 14.7% had combined alcohol with tobacco. In fourth position was the combination

**Table 1: Four-week prevalences (%) of the separate substances by gender**

Substances	Girls	Boys	Total
Alcohol	45.8	54.1	49.8
Tobacco	26.6	25.2	25.9
Cannabis	5.9	10.0	7.9
Ecstasy	0.6	1.8	1.2
Cocaine	0.4	1.7	1.1
Amphetamines	0.6	1.2	0.9
Heroin	0.2	0.4	0.3

**Table 2: Top 10 of four-week prevalences (%) of no use, mono- and polyuse by gender**

Substances	Girls	Boys	Total
Nothing	48.0	41.5	43.3
Only alcohol	24.8	31.2	28.2
Alcohol, tobacco	15.3	12.9	14.7
Alcohol, tobacco, cannabis	4.0	6.0	5.4
Only tobacco	5.9	3.4	4.8
Alcohol, cannabis	0.5	1.4	1.0
Tobacco, cannabis	0.2	0.6	0.5
Alcohol, tobacco, cannabis, other	0.3	0.5	0.4
Alcohol, tobacco, cannabis, cocaine	0.1	0.3	0.2
Alcohol, tobacco, cannabis, amphetamine	0.2	0.2	0.2
Total	99.2	97.7	98.5



of alcohol, tobacco and cannabis, with a prevalence of 5.4%, followed by the group of students using only tobacco (4.8%). All other patterns of substance use showed prevalence rates of 1% or less. We counted 46 patterns of use, but the top 10 accounted for 98% of the students and, consequently, gives an accurate picture. Of the students who had used at least one substance during the previous month (56.7% of students), 41.8% were polydrug users.

## Pairwise associations between substances

Table 3 shows how the use of one substance increased the likelihood of the use of another substance. For instance, the use of any other substance was about double for alcohol users compared with the general population. Among tobacco users, the likelihood of cannabis use was three times higher than among the general population. To use another example, cocaine use had a low prevalence among the general population. However, among cannabis users, the prevalence of cocaine use was almost 10 times higher, and among ecstasy users the prevalence was 43 times higher. Heroin use appeared to coincide mainly with the use of amphetamines and cocaine.

## Clusters

Table 3 shows the associations between pairs of substances. However, we also wanted to know whether clusters of three or more substances could be found. These clusters are depicted in Figure 1.

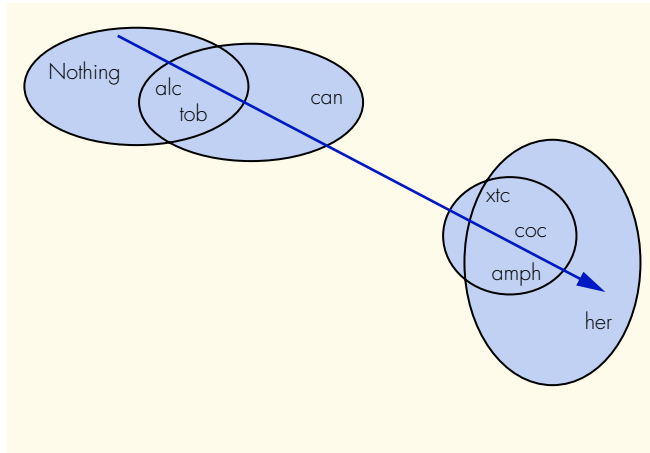
A homogeneity analysis (HOMALS) solution of substance use results in a graph in which the distances between the substances illustrates how drug use clusters. The line in Figure 1 runs from non-use, via alcohol, tobacco and cannabis use to ecstasy, cocaine and amphetamines use, and finally reaches heroin. It shows that non-use and the use of alcohol and tobacco are located close together. This mutual proximity points to a relationship which may be interpreted as the level of social acceptance of non-use and the use of alcohol and tobacco. The associations between alcohol, tobacco and cannabis use can then be regarded as a second cluster. Noticeably, a third cluster, in which ecstasy, cocaine and amphetamines were found close together, was located at some distance from the first two clusters. These 'harder' substances appear to be mainly used in recreational settings, and are, therefore, otherwise known as 'party drugs'. Heroin was located the furthest from the 'normal' use of alcohol and tobacco.



Table 3: Percentages of use of one substance (in rows) given the use of another substance (in columns). In the first column the (unconditional) prevalences are presented

Substance	Prevalence	Alcohol	Tobacco	Cannabis	Ecstasy	Cocaine	Amphetamines	Heroin
Alcohol	49.8	–	80.0	93.0	93.3	94.0	87.7	83.7
Tobacco	25.9	41.6	–	86.0	85.4	85.4	80.9	73.4
Cannabis	7.9	14.7	26.3	–	76.1	74.5	72.1	55.0
Ecstasy	1.2	2.3	4.0	11.8	–	53.9	49.7	46.2
Cocaine	1.1	2.0	3.5	10.1	47.0	–	52.9	49.8
Amphetamines	0.9	1.6	2.9	8.4	37.2	45.4	–	46.7
Heroin	0.3	0.6	0.9	2.3	12.5	15.5	16.9	–

Figure 1: Clusters of three or more substances



Note: Alc, alcohol; amph, amphetamines; can, cannabis; coc, cocaine; her, heroin; tob, tobacco; xtc, ecstasy.

## Typology of polydrug users

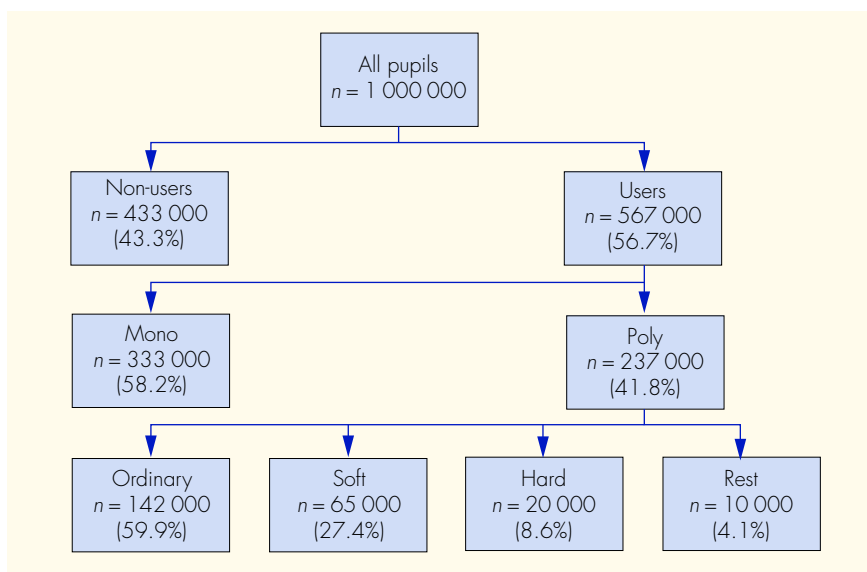
The previous analyses showed, in different ways, that a number of clusters of substances can be found. Closer inspection of Table 3 reveals a hierarchy which resembles Russian dolls, each enclosing the other: a heroin user almost certainly uses one or more of the party drugs, while a user of party drugs is more than likely to use alcohol, tobacco and cannabis. Taking these patterns into account, we tried to construe a hierarchical typology of polydrug users. In so doing, we strove to place in a concise typology as many polydrug users as possible. We came up with three types of polydrug users:

- Type A: students who combined only alcohol and tobacco and used no other substances. We called this type the 'ordinary' polydrug users.
- Type B: students who used cannabis in addition to alcohol or tobacco, but did not use hard drugs. We called this type 'soft' polydrug users. It should be mentioned here that, under Dutch law, cannabis is recognised as a 'soft drug' as opposed to a 'hard drug' such as ecstasy, amphetamines, cocaine or heroin, hence, our use of the phrase 'soft polydrug user'.
- Type C: students who used one or more hard drugs (ecstasy, cocaine, amphetamines, heroin) in addition to alcohol, tobacco or cannabis. We called this type of user a 'hard' polydrug user.

Type A represented 59.9% of polydrug users, type B 27.4% and type C 8.6%. In all, 95.9% of polydrug users were described by this typology. The remaining 4.1% must be classified as 'atypical', since they used two or more hard drugs, without combining them with alcohol, tobacco or cannabis. Extrapolating our findings to 1 million students in the



Figure 2: Classification of adolescent drug use and prevalence rates (per 1 million)



population, we would expect to find 142 000 'ordinary', 65 000 'soft' polydrug users, 20 000 'hard' polydrug users and 10 000 'atypical polydrug users' (Figure 2).

## Risk profiles per type

Table 4 shows the associations between the demographic characteristics and the three types of polydrug users. The group that did not use any of the substances during the four weeks before the study was used as the reference group. A measure for association is the odds ratio (OR). An  $OR < 1$  implies that the presence of a demographic characteristic is associated with a lower risk being the type of polydrug user concerned. A demographic characteristic with an  $OR > 1$  implies a higher risk. All ORs were corrected for the influence of the other variables in Table 4.

Age was related to every group type. As the age of the student increased, the risk of belonging to one of the three types of polydrug users also increased. The risk of becoming an 'ordinary' polydrug user increased by a factor of 2.17 for every additional year. For 'soft' and 'hard' polydrug use, these factors are 3.09 and 2.58, respectively. Age, therefore, was a general and not a specific risk factor.

There was no statistically significant difference between boys and girls in the risk of becoming an 'ordinary' polydrug user. However, boys had a greater risk of becoming a type B or type C. As gender was a differentiating factor, it could be regarded as a

Table 4: Demographic risk profile of polydrug users compared with abstainers

Risk factor	Type A (alcohol and tobacco only)		Type B (alcohol or tobacco and cannabis)		Type C (soft drug and hard drug)	
	OR <sup>a</sup>	Significance	OR	Significance	OR	Significance
Age (years)	2.17	***	3.09	***	2.58	***
Gender (ref = girls)	0.96		1.80	**	2.51	**
Urbanisation <sup>b</sup>	0.62	*	0.69		0.63	
<b>School type (reference = lower vocational education)</b>						
First-class secondary school	0.61	*	0.76		0.44	*
Lower general	0.91		1.29		0.53	
Higher general	0.73		0.69		0.50	*
Pre-university	0.47	**	0.42	*	0.20	*
<b>Ethnicity (reference = Dutch)</b>						
Caribbean	0.72		0.79		0.30	
Surinamese	0.38	***	0.81		0.75	
Moroccan	0.03	***	0.11	***	0.06	**
Turkish	0.14	***	0.20	*	0.58	
Other	0.53	**	0.84		1.40	

## Notes

<sup>a</sup>OR, corrected odds ratio.<sup>b</sup>index = very densely urbanised (versus the rest).\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

specific risk factor for 'soft' and 'hard' polydrug use. Living in a highly urbanised area coincided with a smaller risk of becoming an 'ordinary' polydrug user. Students who attended lower vocational education had the highest risk of polydrug use, and especially of 'hard' polydrug use. Students who attended pre-university education had the lowest risk of polydrug use. Students in higher general education had a significantly lower risk of becoming a type C. Students in the first year of secondary school had a significantly lower risk of belonging to types A and B.

Compared with different ethnic groups, autochthonous Dutch had a larger risk of belonging to any type of polydrug users. Moroccans, in particular, had a very low risk of becoming a polydrug user. This also applied, but to a lesser extent, to students of Turkish origin and, as far as the A-type was concerned, to Surinamese students and students from other ethnic origins. Students from the Caribbean did not differ significantly from the Dutch.

## Discussion

### Main findings

With this study we wanted to answer three questions concerning polydrug use among secondary school students: Which combinations occur most frequently and where does cannabis fit in? What are the numbers of students per user type? What are the corresponding risk profiles? We are now able to answer these questions as follows.

Looking at all the students (abstainers included), almost a quarter (23.7%) were polydrug users. Thus, among a student population of 1 million students in the age range 12–16 years, approximately 237 000 would be polydrug users. Among students who reported using one or more substances (abstainers excluded), almost one-half (41.8%) were polydrug users. We were able to classify nearly all of these polydrug users using a simple typology. 'Ordinary' polydrug use (only alcohol and tobacco), which extrapolates to 142 000 students per million, was by far the most common type. This was followed at some distance by a group of 65 000 students who might be classified as 'soft' polydrug users (alcohol or tobacco combined with cannabis). 'Hard' polydrug use (alcohol, tobacco or cannabis combined with a hard drug) is relatively rare, extrapolating to 20 000 students.

Thus, the position of cannabis use in the context of polydrug use is an ambiguous one. On the one hand, cannabis use is more strongly associated with drinking and smoking than with the use of hard drugs. On the other hand, cannabis users show higher prevalence rates of hard drug use than is the case among drinkers and smokers. In other words, cannabis use occupies the 'middle ground' between alcohol/tobacco and 'hard drug' use. The risk of belonging to a 'soft' or 'hard' type of polydrug user increases with age, is largest for ethnically Dutch students, is very low among Moroccans and limited among Turkish and Surinamese students, and seemed to be concentrated mostly in the lower educational school types. Compared with girls, boys have a specific risk of becoming a 'soft' or 'hard' polydrug user; however, the risk of becoming an 'ordinary' polydrug user is equal for both sexes.

### Limitations of this study

Before we discuss the implications of our findings, we want to address the limitations of our study. Firstly, our data come from a cross-sectional study. Therefore, we cannot make causal inferences. However, the associations found can be helpful in identifying groups at risk. Secondly, the data were based on self-reports. Consequently, recall errors could have occurred (Engels et al., 1997). However, we expect these errors to play only a minor role, because the questionnaire was concerned with recent behaviour,



i.e. during the last four weeks. This idea finds empirical support elsewhere (O'Malley et al., 1983; Johnston and O'Malley, 1985). Systematic errors (bias) in self-reports are another concern. It is conceivable that not all students disclosed the true rates of their drug use and some under- or over-reporting cannot be ruled out.

Thirdly, in this study polydrug use was measured as the use of two or more substances in the four weeks preceding the study. It is possible that this type of polydrug use is less harmful and therefore of less importance than simultaneous polydrug use, when a user combines two or more substances on the same occasion (see Earlywine and Newcomb, 1997; Collins et al., 1998). However, regarding these effects, the distinction between the forms of polydrug use is not unequivocal, because metabolites of a substance can still be present in the body when another substance is used several days later. Moreover, the study of Collins et al. (1998) showed that, among people who used several substances during the previous year, 76% used these substances simultaneously.

Finally, because we have only looked into substance use during the preceding four weeks, it is unknown whether it concerned occasional (i.e. experimental) use or a longer history of substance use. In addition, this study does not provide information on the frequency and the amounts that were used. For example, while we have proposed that a 'hard' polydrug group of users exists, we cannot determine whether this group represents problematic behaviour as we have no additional information on the length and frequency of the use and the amounts used.

## Implications for future research

Taking into account the findings and limitations of this study, we want to present the following considerations. First, Table 3 and Figure 1 suggest an 'axis of use', with alcohol on one side being the most commonly used substance, followed by tobacco, cannabis, ecstasy, cocaine and amphetamines, and ending with heroin. A Norwegian study (Pedersen and Skrondal, 1999) found an almost identical sequence, although they did not include cocaine. Similar sequences are also found in longitudinal studies (cf. Bailey, 1992; Kandel et al., 1992).

Since cannabis is usually smoked, it is suggested that cigarette smoking might act as a 'gateway' to cannabis use (Kandel et al., 1992). However, although there seems to be a natural sequence in the use of the various substances, it is not clear whether there is a direct causal influence. For example, Lynskey et al. (1998) concluded from their results that correlations between tobacco, alcohol and cannabis use during adolescence are largely or wholly non-causal and arise because the risk factors and life pathways that encourage the use of one substance also encourage the use of other substances.



Furthermore, there are also indications for a reverse influence. Amos et al. (2004) found that, among those who wanted to quit smoking, cannabis use reinforced cigarette smoking (see also Coggans, this monograph). While smoking and alcohol use often precede cannabis use, most drug users use cannabis first before progressing to other drugs. Findings from a 21-year longitudinal study of a New Zealand birth cohort seem to support the view that cannabis may act as a gateway, encouraging the use of hard drugs. However, the authors state that they cannot rule out the possibility that the association is non-causal and reflects uncontrolled confounding factors (Fergusson and Horwood, 2000). The mere existence of a sequence does not imply a causal role. More important is the question of how many people follow this route, and how far they venture on that route. Considering our data, we are inclined to conclude that, as far as a 'route' exists, it does not imply that everybody takes that route, or follows it to its full 'extent'.

Our cross-sectional snapshot study identifies some groups that were more inclined to venture a long way on this route. These were mainly ethnically Dutch boys in the lower secondary school types. Explaining why this is so, although an intriguing subject, lies beyond the scope of this study. Again, it must be emphasised that in this 'snapshot' study, the observed sequence cannot be read as a deterministic longitudinal pathway of individual drug use careers.

Second, the HOMALS analysis reveals an interesting finding: use of cannabis was relatively far removed from the use of hard drugs. Likewise, 'hard' polydrug use was less prevalent than either 'soft' or 'ordinary' polydrug use. This might be, in part, a reflection of the Dutch policy on drug use, in which the markets for soft and hard drugs are separated as much as possible, in order to prevent people who buy cannabis getting into contact with hard drugs and criminality (Verdurmen and Van Laar, 2005). However, how the licit/illicit divide affects the prevalence rates cannot be deduced from our data.

Third, this study shows that drug use should, to a very large extent, be equated with polydrug use, especially as far as alcohol, tobacco and cannabis are concerned. Until now, information regarding polydrug use was lacking in the Netherlands and it is fairly rare elsewhere. This information gap forms an obstacle for adequate policymaking.

Finally, the polydrug use patterns discerned in this study could be leveraged in future research:

- Can the typology found in this study be replicated?
- What are the prevalence rates per user type, and do these rates differ across countries?
- Is each user type associated with a distinct risk profile, enabling high-risk groups to be recognised and targeted?

- In longitudinal studies, can we determine whether young people progress toward the use of harder drugs by moving from one user type to another?
- What kind of qualitative research will help us shed light on the main drivers (or motives) that influence how a student moves from one user type to another?

## Bibliography

- Abraham, M. D., Cohen, P. D. A., Van Til, R.-J., De Winter, M. A. L. (1999), *Licit and illicit drug use in the Netherlands, 1997*, CEDRO, Amsterdam.
- Amos, A., Wiltshire, S., Bostock, Y., Haw, S., McNeill, A. (2004), ‘“You can’t go without a fag ... you need it for your hash” — a qualitative exploration of smoking, cannabis and young people’, *Addiction* 99: 77–81.
- Bailey, S. L. (1992), ‘Adolescents and multisubstance use patterns: the role of heavy alcohol and cigarette use’, *American Journal of Public Health* 82(9): 1220–1224.
- Collins, R. L., Ellickson, P. L., Bell, R. M. (1998), ‘Simultaneous polydrug use among teens: prevalence and predictor’, *Journal of Substance Abuse* 10: 233–253.
- Earleywine, M., Newcomb, M. D. (1997), ‘Concurrent versus simultaneous polydrug use: prevalence, correlates, discriminant validity, and prospective effects on health outcome’, *Experimental and Clinical Psychopharmacology* 5(4): 353–364.
- Engels, R., Knibbe, R. A., Drop, M. J., de Haan, Y. (1997), ‘Homogeneity of cigarette smoking within peer groups: influence or selection?’, *Health Education Behaviour* 24: 801–811.
- EMCDDA (2001), *Annual report 2001*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- Feigelman, W., Gorman, B. S., Lee, J. A. (1998), ‘Binge drinkers, illicit drug users, and polydrug users: an epidemiological study of American collegians’, *Journal of Alcohol and Drug Education* 44(1): 47–69.
- Fergusson, D., Horwood, L. (2000), ‘Does cannabis use encourage other forms of illicit drug use?’, *Addiction* 95: 505–520.
- Galaif, E. R., Newcomb, M. D. (1999), ‘Predictors of polydrug use among four ethnic groups: a 12-year longitudinal study’, *Addictive Behaviors* 24(5): 607–631.
- van de Geer, J. (1993), *Multivariate analysis of categorical data: theory*, Sage, Newbury Park.
- van der Heijden, P., Gilula, Z., van der Ark, L. (1999), ‘An extended study into the relationships between correspondence analysis and latent class analysis’, 147–186 in M. Sobel and M. Becker (eds), *Sociological Methodology*, Blackwell, Cambridge.
- IVV (2001), *Kerncijfers Verslavingszorg 2000, Landelijke Alcohol en Drugs Informatie Systeem (LADIS) [Core data on addiction treatment 2000, National Alcohol and Drugs Information System]*, Stichting Informatie Voorziening Verslavingszorg (IVV), Houten.
- Jessor, R. (1987), ‘Problem-behavior theory, psychological development and adolescent problem drinking’, *British Journal of Addiction* 82: 331–342.
- Johnston, L. D., O’Malley, P. (1985), ‘Issues of validity and population coverage in student surveys of drug use’, in Rouse, B., Casual, N., Richard, L. (eds), *Self-report methods of estimating drug use: meeting current challenges to validity*, NIDA Research Monograph 57, US Government Printing Office, Washington DC, 31–54.
- Kandel, D. B., Yamaguchi, K., Chen, K. (1992), ‘Stages of progression in drug involvement from adolescence to adulthood: further evidence for the Gateway theory’, *Journal of Studies on Alcohol* 53: 447–457.
- Korf, D., Nabbe, T., Benschop, A. (2001), *Antenne 2000. Trends in alcohol, tabak, drugs en gokken bij jonge Amsterdammers* [Trends in alcohol, tobacco, drugs and gambling among the Amsterdam youth population], Rozenberg Publishers, Amsterdam.

- Leccese, A., Pennings, E., De Wolf, F. (2000), *Combined use of alcohol and psychotropic drugs. A review of the literature*, Academic Hospital Leiden (AZL), Leiden.
- Lynskey, M., Fergusson, D., Horwood, L. (1998), 'The origins of the correlations between tobacco, alcohol and cannabis use during adolescence', *Journal of Child Psychology and Psychiatry* 39: 995–1005.
- Martin, C., Clifford, P., Clapper, R. (1992), 'Patterns and predictors of simultaneous and concurrent use of alcohol, tobacco, marijuana, and hallucinogens in first-year college students', *Journal of Substance Abuse* 4: 319–326.
- Measham, F., Aldridge, J., Parker, H. (2002), *Dancing on drugs: risk, health and hedonism in the British club scene*, Free Association Books, London.
- Monshouwer, K., Smit, F., De Zwart, W., Spruit, I., Van Ameijden, E. (2003), 'Progress from a first drink to first intoxication: age of onset, time-windows and risk factors in a Dutch national sample of secondary school students', *Journal of Substance Use* 8: 155–163.
- NDM (2001), *Nationale drug monitor: jaarbericht 2001* [National drugs monitor: annual report 2001], Trimbos-instituut, Bureau Nationale Drug Monitor, Utrecht.
- O'Malley, P., Bachman, J., Hohnston, L. (1983), 'Reliability and consistency in self-reports of drug use', *International Journal of Addiction* 18: 805–824.
- Parker, H., Aldridge, J., Measham, F. (1998), *Illegal leisure: the normalization of adolescent recreational drug use*, Routledge, London.
- Pedersen, W., Skrondal, A. (1999), 'Ecstasy and new patterns of drug use: a normal population study', *Addiction* 94: 1695–1706.
- Smit, F., Monshouwer, K., Verdurmen, J. (2002a), 'Polydrug use among secondary school students: combinations, prevalences and risk-profiles', *Drugs: Education, Prevention and Policy* 9: 355–365.
- Smit, F., Zwart, W. de, Spruit, I., Monshouwer, K., Ameijden, E. van. (2002b), 'Monitoring substance use in adolescents: school- or household survey?', *Drugs: Education, Prevention and Policy* 9: 267–274.
- SPSS Inc. (1988), *Statistical software for the social sciences*, SPSS, Chicago.
- StataCorp (1997), *Stata release 6.0*, College Station, Stata Press.
- Stronski, S., Ireland, M., Michaud, P., Narring, F., Resnick, M. (2000), 'Protective correlates of stages in adolescent substance use: a Swiss national study', *Journal of Adolescent Health* 26: 420–427.
- Taylor, S., Chermack, S. (1993), 'Alcohol, drugs and human physical aggression', *Journal of Studies on Alcohol and Drugs* (Suppl. 11): 78–88.
- Verdurmen, J., Van Laar, M. (2005), *Factsheet drugsbeleid* [Factsheet Drug policy], Trimbos Institute, Utrecht.
- Vermaas, P. (1999), 'Drugs en geweld: polygebruikers zijn onvoorspelbaar agressief' [Drugs and violence: polydrug users are unpredictably aggressive], *Algemeen politieblad* 10: 3.
- Zwart, W. de, Monshouwer, K., Smit, F. (2000), *Jeugd en riskant gedrag: kerngegevens 1999. Roken, drinken, drugsgebruik en gokken onder scholieren vanaf tien jaar* [Adolescents and high-risk behaviour: core data 1999. Smoking, drinking, drug abuse and gambling among schoolchildren from the age of 10], Trimbos Institute, Utrecht.







## Chapter 5

# Cannabis users and their relation to Finnish society

**Keywords:** advocacy – anthropology – behaviour – cannabis – deviance – Finland – sociology – subcultures

### Setting the context

The great societal themes — power, status, wealth, religion, tolerance, class, mainstream culture, subcultures, generational divides, crime, respect for the law — all have a bearing on drug use and the way it is perceived. In Europe, in a similar way to consumption patterns, societal acceptance of cannabis use and perceptions of its users varies greatly across the continent.

As if to demonstrate the complexity of cannabis's role in society, the languages of Europe have spawned entire vocabularies to describe cannabis, its users, its paraphernalia and its cultural symbolism. Cannabis has many street names in all European languages. In English, dictionaries of cannabis slang run to several hundred terms. When crossing linguistic borders from Lisbon to Helsinki, a cannabis cigarette will be variously named a 'charro', 'porro', 'pétard', 'joint' or 'pind'. It may be associated with all kinds of youth tribes and subgroups, from surfers and skaters, through *okupas* and *pasotas*, *casseurs*, *hoodies*, *clubbers* and *kiffers*, *new bohemians* and *bobos*, to *rastas*, *hip-hoppers*, and — perhaps the core archetype — *hippies*. Yet cannabis will also be consumed by people who would consider themselves entirely mainstream, and not affiliated to any particular sociological groups.

In this chapter, we take an anthropological look at cannabis. Based on structured interviews with cannabis users, the author examines social attitudes to cannabis use in Finland. Subcategories of cannabis users are defined, and the author looks at reasons why people smoke cannabis and the meanings they attach to the substance. In including this case study in a European monograph, the EMCDDA does not suggest that



## Cannabis users and their relation to Finnish society

observations in the Finnish context will translate wholeheartedly to a wider Europe in which diversity, not homogeneity, is the norm.

Nonetheless, readers are likely to recognise many of the experiences, thoughts and ideas expressed by the interviewees. Numerous concepts bubble up to the surface: escapism, group affiliation and individuality, clandestine activity, fear of exclusion from employment, confrontation, rebellion and rejection, taboo-breaking, societal withdrawal and engagement. There are also interesting insights common to all societal subgroups: visible signals of affiliation to the group and adapting behaviour to fit when in a mainstream environment.

## Further reading

- Amos, A., Wiltshire, S., Bostock, Y., Haw, S., McNeill, A. (2004), "You can't go without a fag ... you need it for your hash" — a qualitative exploration of smoking, cannabis and young people', *Addiction* 99(1): 77–81.
- Becker, H. (1963), *Outsiders: studies in the sociology of deviance*, The Free Press, New York.
- Downes, D., Rock, P. (2003), *Understanding Deviance*, 4th edition, Oxford University Press, Oxford.
- Lalander, P., Salasuo, M. (eds) (2005), *NAD Nr 46 drugs and youth cultures — global and local expressions*, Nordic Centre for Alcohol and Drug Research, Helsinki.
- Melrose, M., Turner, P., Pitts, J., Barrett, D. (2007), *The impact of heavy cannabis use on young people: vulnerability and youth transitions*, Joseph Rowntree Foundation, York.
- Miles, S. (2000), *Youth lifestyles in a changing world*, Open University Press, Buckingham.
- Parker, H., Measham, F., Aldridge, J. (2001 [1998]), *Illegal leisure. The normalisation of adolescent recreational drug use*, Routledge, New York.

# Cannabis users and their relation to Finnish society

Taru Kekoni

## Abstract

This article examines the relationship of Finnish cannabis users to society. A total of 35 cannabis users were interviewed for the study. The narrative modes that were identified, which interviewees employ to describe their relationship to Finnish society, included 'concealed use', 'open activism' and 'social withdrawal'.

In the narrative of 'concealed use' the cannabis user wishes to appear as an upholder of traditional values and conventional lifestyles, even though there is a hidden, 'deviant' behaviour in the background. The most significant denominators of the relationship to society are controls and mechanisms related to concealment. In the narrative of 'open activism' the relationship to society is constructed on the basis of an openly alternative lifestyle connected to cannabis use and the associated activism. In the 'social withdrawal' narrative, the user's relationship to society is characterised by experiences of being offended or excluded because of his or her cannabis use. Withdrawal may also be a personal choice to stay outside the constraints of social activity.

## Background to cannabis use in Finland

Cannabis is the most frequently used illegal narcotic substance in Finland, though cannabis prevalence is low compared with the European average. According to information for 2004, lifetime prevalence in the age group 15–64 years was 12.9%, last year prevalence 2.9% and last month prevalence 1.6%. Judging by these figures, the maximum number of 'regular cannabis users' in Finland could be estimated at about 40 000. The majority of cannabis users are below 29 years of age, and two-thirds are male. As regards socio-economic status and marital status, cannabis use is most prevalent among students and unmarried or co-habiting persons, reflecting the young age of the majority of users. In terms of geography, cannabis use is clearly concentrated in the capital region around Helsinki and elsewhere in southern Finland. Overall, prevalence of use and experimentation with cannabis increased by about 50% from the mid-1990s to the 2000s, although in recent years the level of experimentation reported among school students has declined. Increases in regular use are estimated to have levelled off at the beginning of the 2000s (Hakkarainen and Metso, 2003). Cannabis use, home growing, possession, buying, importing and distribution are all criminalised

under Finnish law. The consequence of being caught using cannabis is most often a fine, although incarceration of up to 10 years is a possible penalty for cannabis-related crimes.

Seppälä and Mikkola (2004) consider that the cultural meaning of cannabis use in Finland is distributed along at least two distinct axes. On the one hand, cannabis does not possess a single homogeneous 'world of meaning', but different circles associate it with widely divergent 'meanings'. In addition to its symbolic value, cannabis has emerged as a kind of 'universal drug', with its use defined not only by different meanings related to subcultures, but also by loose and flexible mainstream meanings. On the other hand, cannabis use itself is associated with an abundance of tangible cultural products and paraphernalia, which is manifested, for example, by various implements for its use, by cannabis varieties and by historical and cultural stories linked to cannabis.

In their study of cannabis use from the viewpoint of research into social identity, Hammersley et al. (2001) note that cannabis users are connected to the surrounding society and the mainstream population in many ways. Nevertheless, their use of cannabis also requires the ability to manage an illegal activity carrying negative sanctions, including potential exclusion from arenas of social activity. This is equivalent to managing a hidden 'disability' (Goffman, 1963) or hidden deviancy (Becker, 1963) (cf. Young, 1999). There is a requirement that cannabis use is hidden from one set of people but revealed to another, to the right people under the right social circumstances. The social identity of the user is, in fact, shaped depending on the situation (Hammersley et al., 2001), and is a continuously evolving, dynamic characteristic.

## Analysis and description of the data

This chapter examines the relationship of Finnish cannabis users to society, and the conditions under which the relationship is constructed. The users' 'relationship to society' is defined as the individual's experience of his or her own social status and the means by which this status is constructed and maintained in relationship to the mainstream population and social constraints. The questions posed were:

- In relation to personal cannabis use, how did the user perceive his or her relationship to the structures of surrounding society and the mainstream population?
- What meanings, behaviours and coping mechanisms do the cannabis users associate with their relationship to society?

The analysis combines the methodological approaches of grounded theory and narrative research. It aims to identify the narrative modes which cannabis users employ



in interviews to describe their relationship to Finnish society to the researcher. These narrative modes have been structured into concepts that have been categorised into 'concealed use', 'open activism' and 'social withdrawal'. In the analysis of the data, it is considered possible to move between realistic and constructionist discourse (cf. Glassner and Loughlin, 1987: 34–35). The data reveal something of what actually happens but, at the same time, information is generated precisely in the research situation and for it (cf. Pösö 2004: 35–36).

A total of 35 cannabis users were interviewed for the study. Since the focus of interest was the ideological thinking and social activity related to cannabis use in more general terms, data collection was initiated by submitting an interview request to the electronic mailing list of the Finnish Cannabis Association. Leaflets containing a description of the study and the researcher's contact data were also distributed during the Million Marijuana March in Tampere in the spring of 2003. The way in which data were collected has a clear effect on the selection of interviewees. The data were considerably affected by the recruitment of persons who use cannabis exclusively, or as their main drug. Because of this, the extensive group who use cannabis in addition to other drugs has been almost completely excluded from the data. On the other hand, it seems obvious that the data do not include people who deny using cannabis, people who use it only very occasionally and people who express very little (or no) ideological 'choice' in using cannabis.

The majority of the interviewees were men (23). The average age of the interviewees was 32 years, ranging from 19 to 56 years. The interviewees mainly lived in or near large cities in south and south-west Finland, but a few came from further north and smaller localities. All the interviewees contacted the researcher voluntarily.

### **'Concealed use' as the relationship to society**

'Concealed use' is defined as the type of cannabis use and the associated relationship to society in which efforts are made to conceal use of cannabis from organisations and persons who might have a negative impact on the user's social status if they learned about its use. Among the interviewees who described their relationship to society within a 'concealed use' narrative, nine were students in secondary or tertiary education, six were gainfully employed and one was unemployed at the time of interview. Among the total of 12 women in this study, 10 were placed in this category. The average age of the group members was 29.5 years, ranging from 19 to 47 years. The youngest interviewees belonged to this group. Two of the interviewees were married, seven were co-habiting and six were single, of whom one was divorced and one lived with his parents.



## Cannabis users and their relation to Finnish society

In terms of gender and employment, the figures for this group differ significantly from the statistical data available on Finnish cannabis users (see Hakkarainen and Metso, 2003). The narrative of 'concealed use' appears understandable in the light of the socio-economic situation of those who described their relationship to society within this narrative. In one way or another, being revealed as a cannabis user could endanger the relatively stable social status these interviewees had achieved, or could lead to unfortunate consequences for the family situation or other social relationships. 'Concealed use' has clear links with the 'hidden deviancy' behaviour described by Becker (1963). The person's behaviour deviates in some aspects from social rules and norms, and the behaviour is concealed from the mainstream population (Oinonen, 2002).

The general motives mentioned for 'concealed use' are the fear of losing one's job or study opportunity or, in general, the fear of being stigmatised if cannabis use becomes known to the employer or a teacher. The fear in itself is not groundless, for several interviewees had actually lost their jobs after being revealed as cannabis users. On the other hand, a significant cause for fear is that a projected course of study or work career would founder due to cannabis use if a narcotics crime were to be listed on the user's criminal record. In Finland, an extract of criminal records is required of persons applying for jobs with minor children, and one of the categories relevant to this occupation is crimes related to narcotics.

Another important motive for concealed use is the fear of being caught by the authorities. Besides an entry in their criminal records, the interviewees fear a house search or surveillance by the police. Interviewees with families also fear the intervention of the social services in family life if the parents are found to be using cannabis. The fear of being caught is most acutely linked to the buying of cannabis, which often brings the users in contact with 'actual' drug criminals. In fact, after becoming parents many interviewees have purposefully distanced themselves from criminal circles. Users do not necessarily want to give up cannabis because of their children, though all interviewed mothers did report that they had given it up during pregnancy and breast-feeding, and the solution adopted may be to grow cannabis either at home or at a friend's home.

## Means of concealment

Cannabis users describe various ways in which concealment is practised and their relationship to society maintained. 'Not telling' as a means of concealment means that the use is hidden from most of one's acquaintances and only revealed to one's most intimate circle, who are themselves often users or otherwise approve of cannabis use. 'Not telling' is the easiest solution if one wants to avoid guilt-inducing or condemnatory reactions from third parties. Not telling is also relatively easy. Cannabis use is not a





general topic of conversation. On the contrary, several interviewees report that a kind of 'culture of silence' prevails both within families and in public.

'Controlling use' is another important means of concealment vis-à-vis the mainstream population. At the same time, it is a qualitative or quantitative check on the habit. Means of control may be related to the place and time of use, as well as to the mode and intensity of use. In most cases, use is reported to take place at home or in another private space, alone or with certain friends. Users also report that the time of use is significant in terms of how 'deviant' they consider their behaviour to be. Users mostly say that use is generally accepted in the evening, which is when the interviewees mostly reported using cannabis. Controlling use in order to be courteous and well mannered are also described. For instance, it is not considered appropriate to use cannabis in children's play areas, in non-smoking areas, or in situations where others may feel offended or confused because of it. These controls of use are described as 'gentlemen's agreements', whose purpose is not to reveal one's use to others, and also not to weaken the reputation of cannabis use in general any further.

'Not telling' may be experienced as an awkward solution, if one feels compelled to hide a part of one's life that is important for one's identity. In addition to relaxation or enjoyment, cannabis use may contain other meanings, which may be religious, ritual or otherwise strongly linked to one's world view (see, for example, Booth, 2003). In spite of this, it may be necessary to hide one's use to safeguard one's social status, and this may actually be experienced as the biggest problem related to cannabis use. For this reason, affiliation to cannabis culture may be indicated by various symbolic signals. Dreadlocks, or an exceptionally relaxed style of dress, may indicate membership to those who are able to read these symbolic messages. Cannabis use may also be referred to by using terms which outsiders may not understand in the context or by employing gestures which only another user can understand.

It has been noted within cultural criminology research (Ferrel, 2003) that deviant and criminal subcultures are becoming fragmented in a world of symbolic communication. Symbolic communication for cannabis users may partly depend on the desire to experience a community and belonging with other cannabis users, but also on practical needs and the usefulness of revealing oneself or another person as a user. The usefulness may be linked, for instance, to a desire to extend the established circle of users, perhaps with the interest of finding new channels of acquiring cannabis.

### **'Open activism'**

Instead of concealment, the relationship to society of a cannabis user may also be based on 'open activism'. This denotes a relationship with the mainstream population



## Cannabis users and their relation to Finnish society

and social domains in which there is no attempt to hide cannabis use. Rather, there is a desire to bring the matter out into the open, as a topic of debate in both private and public spheres. In the 'open activism' narrative, the most important aspect of cannabis use in relation to social status is considered to be the desire to break the so-called 'culture of silence' surrounding cannabis use. In this context, the interviews also often refer to the taboo aspect of cannabis. The aim of 'open activists' is to bring cannabis, as a topic, from the marginal to the mainstream arenas. On the other hand, in the open activism narrative, openness is also manifested as the personal choice of individuals. Since the matter is strongly linked to the user's way of life, he or she does not want to keep it a secret, but rather shows honestly in all situations his or her personal attitude towards it.

Among the cannabis users interviewed, 13 were 'open activists'. They were all male. The average age of the group was 32.5 years, ranging from 21 to 56 years. Nine of the interviewees were employed at the time of the interview, two were unemployed, one was a secondary school student and one in civilian service (in lieu of conscripted military service). Eight of the interviewees were unmarried, two married, two co-habiting, and one was divorced. Their educational level varied from comprehensive school to university degrees, as in other groups. However, in this group the proportion of interviewees with university degrees was slightly higher than in the others: four out of the total of eight university graduates belonged to this group (three belonged to the 'concealed use group' and one to the 'withdrawal from society' group).

The desire to act as an active proponent of cannabis may be rooted in events in the person's biography, or may be a lifestyle choice. Some activists reported that they were motivated by events in their early childhood. For example, someone with alcoholic parents may view society's relatively permissive attitudes about alcohol and sharply condemnatory attitudes about cannabis as contradictory. This may lead to active defence of cannabis. Similarly, someone who has once been strongly labelled as a cannabis user and faced the consequences may be encouraged to become an open activist. Someone who has already served a prison sentence may feel that loss of social status is already complete, and that it is therefore relatively easy to become an activist.

By contrast, younger activists did not necessarily report alienating experiences related to cannabis use. For them, activism may be only one way of working towards a better and more liberated society. In this narrative, cannabis activism is viewed not so much as a discrete movement but more as a part of a 'culture of resistance' or a general lifestyle that attempts to call into question current values and to create a new, individual value base. It might include criticism of consumer behaviour and the global or national economy. Similarly, the unpleasant effects of continued concealment of cannabis use and the fact that cannabis has become increasingly important for one's lifestyle may have the result that even a younger user becomes an activist. In this narrative, even





being caught by the police may appear as positive, as was noted by an interviewee when describing this situation: ‘So I also thanked the police and said, like, “hey, this is great, now you know about me so I needn’t try to hide anything!”’

In the ‘open activism’ narrative, the relationship to society was described from the viewpoint of personal ideology and lifestyle more markedly than with the preceding group. For activists, personally defending cannabis as a positive substance, a medication and the raw material of various industries is so important that they are ready to jeopardise their own social status.

## Means of open activism

As might be expected, open activists are more likely to be active members of a cannabis advocacy organisation than those belonging to the two other groups. For them, activity in organisations serves as a means of making their cannabis-related thinking and lifestyle more visible and also more acceptable in different social spheres. At the same time, it serves their needs for a community and for sharing experiences with like-minded people. Although the use of cannabis is not regarded personally as wrong or as a criminal activity, the culture constructed around it is constrained by the fact that cannabis use is nonetheless illegal.

Activist organisations strive to spread their message chiefly by means of information provided on their internet pages and through the discussion groups they maintain. Among activists, online media are regarded as very useful channels for disseminating information and promoting more favourable attitudes. By contrast, the Million Marijuana March introduced in 2001 in Finland is regarded as a slightly more dubious way of spreading the message of legalising cannabis. Some of the activists do not take part in the march, for they believe that it attracts stigma for both the participants and cannabis users in general. Finland’s longest-established association, the Finnish Cannabis Association (FCA), active since 1991, has been most assiduous among the cannabis organisations in attempting to establish dialogue with members of parliament and political decision-makers. The means used by FCA for this include position papers and press releases drafted as a result of membership and/or board meetings, which are distributed as widely as possible, including to members of parliament and other political actors. FCA was also consulted when Finland’s first national drug strategy was drawn up in 1997.

Cannabis activists are also prepared to discuss the topic in the arenas of their ‘opponents’ or the mainstream population, and in a manner approved by these opponents. In the open activism narrative, an important enabler of discussion with the mainstream population is the way in which the discussion is conducted. This involves



## Cannabis users and their relation to Finnish society

such concepts as 'adjustment to censorship' and 'orientation to the media'. These imply that it is important to present their message in a form that is not too aggressive towards general social attitudes to cannabis and does not directly offend anyone, not even those who oppose cannabis most strongly. The activists report that they achieve this by 'disguising' the message so that, for example, an item in the press may not even mention the word cannabis, but the attitudes involved are visible in the text in other ways. Another point stressed by interviewees was that the story needs to match the format of the particular media outlet to which it is offered.

The most infrequent means of activism in the interview data is the attempt to exert influence in mainstream arenas. In the data this primarily means activity in party or municipal politics, and defending cannabis together with other personal values in this context. One of the interviewees describes involvement in party politics as a means of open activism and as a personal cause:

It's like, they [cannabis use and becoming aware of its social status] have had a fairly strong impact on my, let's say, awakening, on becoming a conscious human being instead of a sleepwalker, so to speak. So I read the papers more carefully, looked for ways to make an impact, I even joined the party and went to the party convention. Incidentally, I even gave a speech at the convention. There are people there, too, who support legalisation, and, well, my three minutes were that, it was a reply to another speech, in which I mentioned that in my personal opinion people who can't distinguish say, marijuana from coke, then I think a person like that is incapable of taking decisions at all in this matter. Meaning, get informed, you guys, get informed.

## Withdrawal from society

The third narrative mode is one in which cannabis users describe their relationship to society within the narrative of withdrawal from arenas of social activity. 'Withdrawal' may be explained as a personal choice, which is resorted to in order to avoid conflict with the authorities, or more generally, with condemnatory attitudes. On the other hand, withdrawal may also include strong elements of exclusion, whether economically from working life, socially from the mainstream population or judicially from the spheres of 'decent citizens'. In this case, withdrawal may be understood as social exclusion as defined by Young (1999). The withdrawal narrative may also be linked by a strong feeling of being mistreated by society, which is linked either to judicial conflicts or more generally to a feeling of losing one's 'human rights' and being shunned because of one's lifestyle.

Six cannabis users described their relationship to society within the social withdrawal narrative. Two of them were female, and the average age of the group was 36 years,



with actual ages varying from 26 to 50 years. Thus, those classified as belonging to this group were slightly older than those in the other groups. At the time of interview, one of the interviewees was employed, four were unemployed and one was on parental leave. Four group members had completed comprehensive school, one had a secondary-level qualification and one an almost complete university degree. The group included one co-habiting couple, one married person with minor children, one divorced and two unmarried single persons. An interesting distinguishing factor in the demographic data of the social withdrawal group is that they reported having started using cannabis considerably earlier than the other groups. The most commonly reported starting age in the interview data was around 20 years, but in this group the most general starting age was 13–15 years. The average age in Finland for starting the use of cannabis is about 16–18 years (Hakkarainen and Metso, 2003).

The interviewees within the ‘social withdrawal’ narrative reported problems with intoxicant use more frequently than interviewees in the other groups. They reported earlier problematic use of other illegal drugs, medications or alcohol, which had then been dropped as cannabis became the drug they chiefly used. One of the interviewees did not report earlier problematic use of other substances, but did report continuing experimental use of other illegal drugs. In this narrative, more clearly than in the other groups, interviewees suggested that earlier use of cannabis and also current cannabis use was linked, to some degree, to problems or addiction. The problems could be associated with social relationships and with the necessity of withdrawing from them, conflicts with the judiciary, family problems, health problems or difficulties in finding work. Many reported several of these problems. On the other hand, the interviewees could also have experienced addiction as a neutral or even a pleasant experience.

Within the ‘social withdrawal’ narrative, use was almost invariably justified from the viewpoint of maintaining mental balance and/or of mental health problems, mostly depression. The interviewees felt that cannabis use helped to ‘smooth the edges’ of an otherwise bumpy life or to ‘heal traumas’ created during one’s life. Several interviewees reported having used mood medication earlier for the same problems, but had felt that it was of no help or that it had caused severe addiction or other problems.

Two people within the ‘social withdrawal’ narrative reported that a significant factor for their habit was its medicinal impact on physical illnesses which had not been alleviated by any other medicine. Physical symptoms of varying severity (such as headache, flu, asthma, menstrual cramps, migraine, nausea, indigestion) were also reported as the cause of use in the other groups, but the social withdrawal narrative includes the interviewees who reported using cannabis primarily for medicinal reasons.

## Withdrawal as a relationship to society

For these interviewees, social withdrawal primarily meant being excluded from society in one way or another and an experience of being labelled as criminal or otherwise unfit for society. Three people within this narrative talked about recent experiences of being caught by the police or customs. They had been charged with growing cannabis at home, driving under the influence of cannabis and with a crime related to the sale of cannabis products. A house search by the police and the subsequent sentence appears as one example of experienced social exclusion. A cannabis user recently sentenced for the sale of seeds describes the experience as one entailing severe exclusion, which also has unfortunate future consequences:

But now I've actually lost everything, in that I lost all the money I had and it's really difficult getting a job in Finland now that I've a record of drug crimes. And all the liquids that they found, fertilisers and spices, they were sent to the drug laboratory, and they took my photos, my employment certificates and all possible documents. They took my bank statements, my mobile phone and just everything ... And apparently they figured that I'm some drug Mafia man or something. And they just walked into my flat on the grounds that they wanted to see if I had any weapons and so on ...

This extract imparts a strong feeling of an experience of stigmatisation, apparent in such terms as 'drug Mafia man' used by the interviewee to describe himself through the eyes of the authorities. Becker (1963) noted that deviancy does not consist of the behaviour itself, but of the *stigmatisation as deviant* of a behaviour, as a result of the rules and norms of the mainstream population. Thus, a deviant person is a person labelled as such. According to Becker, stigmatisation is a two-directional process. With stigmatisation of the deviant, changes occur in the identity of the person and he or she also begins to feel excluded from society on the level of his or her identity.

More frequently than the other two, the 'social withdrawal' narrative describes the user's intimate circle as consisting mainly of other users. The circle may also include users of stronger drugs than cannabis or persons with links to the sale of cannabis and other criminal activity. This could naturally be caused simply by the fact that friends and acquaintances are generally selected from among people who uphold the same values and have the same hobbies. On the other hand, the mainstream population and old friends may also shut out a cannabis user if, for example, he or she is labelled as criminal or otherwise deviant. Clearly, more often than the other two, the narrative of social withdrawal is linked to unemployment.

## Conclusions

Finnish cannabis users' relationship to society has been categorised into the narratives of 'concealed use', 'open activism' and 'social withdrawal'. The interviewees suggested that in Finland users of illegal drugs are often portrayed in black and white terms and assumed to exist outside domains of social activity, at the margin of society, where distinctive modes and motives of action are constructed for them. Cannabis use is not portrayed differently from use of other illegal substances. On the other hand, cannabis use in the present day may be seen as involving a diverse group of people — especially in the framework of relaxation or recreational use — and it is not necessarily regarded as having any impact on the conditions of a person's relationship to society.

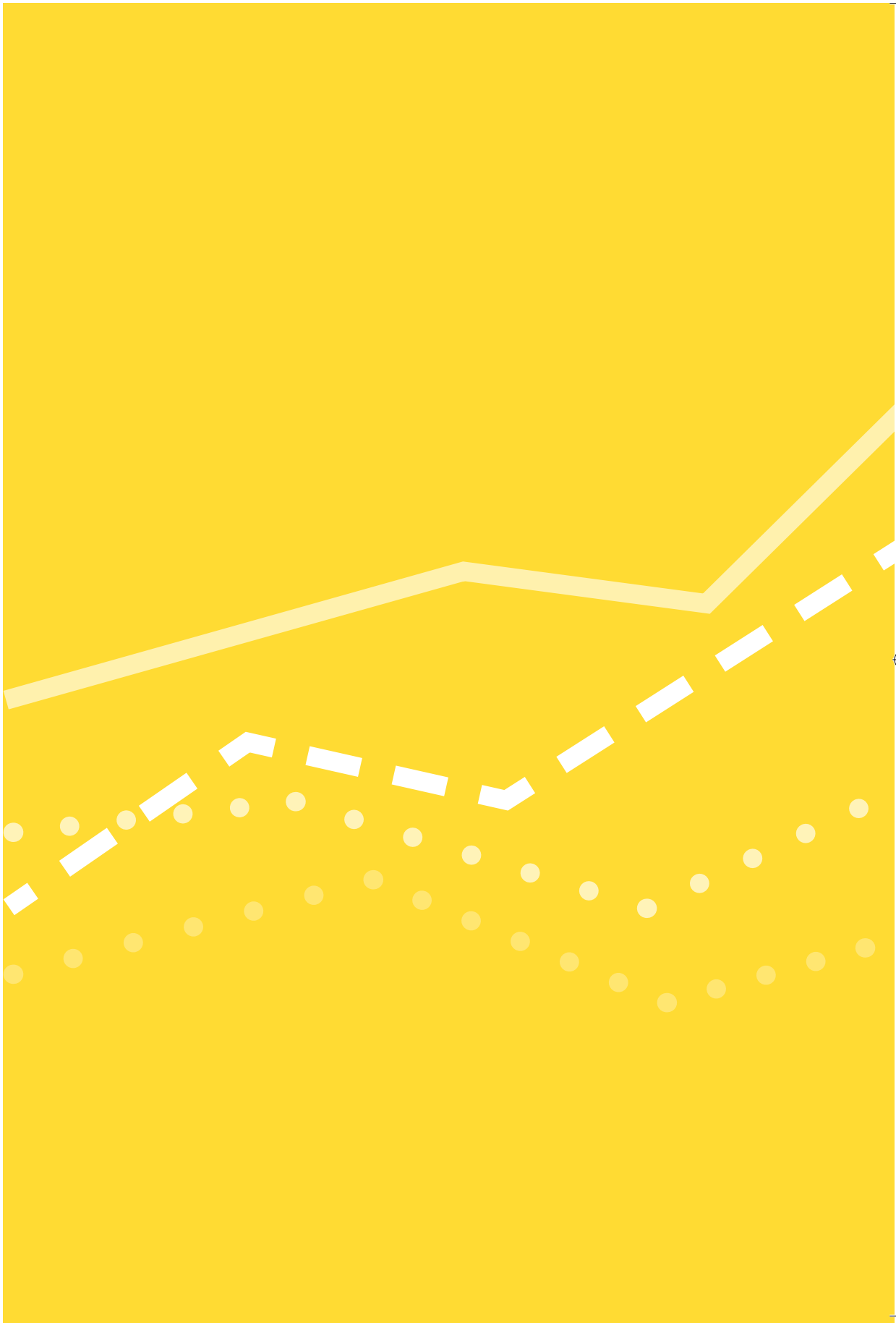
A positive outcome of this study is to reach a set of cannabis users who have been invisible in Finnish drug research before. Reaching and researching hidden populations is one important role of qualitative drug research (Rhodes, 2000). To my knowledge, the relationship of cannabis users and cannabis use to society has previously not been researched or called into question in Finland or in any other European country. According to Rhodes (2000), both the nature of knowledge itself and the process by which it is acquired shape the lived experience and perceived meaning of drug use. Two key tenets of qualitative research are to describe the social meanings participants attach to drug use experiences and the social processes by which such meanings are created, reinforced and reproduced (Moore, 1993; Rhodes, 1995; Agar, 1997). An examination of Finnish cannabis users' relationship to society reveals how cannabis use is lived and interpreted through social interactions.

I have shed some light on the motives, means and ideologies attached to cannabis use in Finland. The study reveals the mechanisms and controls that are employed to make cannabis use possible in a social situation, an activity that carries a risk of relatively strict control policy and judicial sanctions. It also brings to light different ways of viewing society and the divergent positions in which people live. In addition, it reveals different meanings and contents in the internal culture of cannabis use, which may not be easily visible to the mainstream population and therefore unidentified by them.

When studying the use of drugs, one should bear in mind the thesis presented by Howard S. Becker (1970), concerning research on deviancy, according to which it is not the researcher's task to be involved in the value debate concerning the research topic, but simply to study deviancy as behaviour that is condemned by some and approved by others. The study of internal meanings of the culture of use and its relationship to society is one way of understanding cannabis users' way of regarding drug use and its meanings.

## References

- Agar, M. (1997), 'Ethnography: an overview', *Substance Use and Misuse* 32: 1155–1173.
- Becker, H. S. (1963), *Outsiders: studies in the sociology of deviance*, The Free Press, New York.
- Becker, H. S. (1970), 'On methodology', in *Sociological work: method and substance*, Chicago: Aldine Publishing Company, 3–24.
- Booth, M. (2003) *Cannabis: a history*, Doubleday, London.
- Ferrel, J. (1996, 2nd edition 2003), 'Cultural criminology', in McLaughlin, E., Muncie, J., Hughes, G. (eds), *Criminological perspectives. Essential readings*, Sage Publications, New Delhi.
- Glassner, B., Loughlin, J. (1987), *Drugs in adolescent worlds. Burnouts to straights*, Macmillan, Basingstoke and London.
- Goffman, E. (1963), *Stigma. Notes on the management of spoiled identity*, Prentice-Hall Inc., Englewood Cliffs, NJ.
- Hakkarainen, P., Metso, L. (2003), 'Huumeidenkäytön uusi sukupolvi' [New generation of drug use] *Yhteiskuntapolitiikka* 66: 244–256.
- Hammersley, R., Jenkins, R., Reid, M. (2001), 'Cannabis use and social identity', *Addiction Research and Theory* 9: 133–150.
- Moore, D. (1993), 'Ethnography and illicit drug use: dispatches from an anthropologist in the field', *Addiction Research* 1: 11–15.
- Oinonen, T. (2002), 'Kannabiksen "kohtuukäyttö" nuorten aikuisten päihdekuulttuurina' [Moderate use of cannabis among young adults in Finland], *Nuorisotutkimus* 20: 32–42.
- Pösö, T. (2004), *Vakavat silmät ja muita kokemuksia koulukodista* [Serious eyes and other experiences from reformed school], Stakes, Helsinki.
- Rhodes, T. (1995), 'Researching and theorising "risk": notes on the social relation of risk in heroin users' lifestyles', in Aggleton, P., Hart, G., Davies, P. (eds), *AIDS: sexuality, safety and risk*, Taylor and Francis, London.
- Rhodes, T. (2000), 'The multiple roles of qualitative research in understanding and responding to illicit drug use', in *EMCDDA Scientific monograph series No. 4. Understanding and responding to drug use: the role of qualitative research*, Office for Official Publications of the European Communities, Luxembourg.
- Seppälä, P., Mikkola, T. (2004), *Huumeet Internetissä ja nuorisokulttuureissa. Havainnoja huumeiden merkityksistä ja riskikäsityksistä käyttäjäpiireissä* [Drugs in internet and in youth cultures, observations on meanings of drugs and conceptions on risks in user circles], Stakes, Helsinki.
- Young, J. (1999), *The exclusive society. Social exclusion, crime and difference in late modernity*, Sage, London.









# Health effects of cannabis use





# PART II





## Chapter 6

# Cannabis use and physical and mental health

**Keywords:** cannabis – comorbidity – health – lung and respiratory health – mental health – psychosis

### Setting the context

In 1956, the novelist William Burroughs wrote about cannabis that ‘the effects of this drug have been frequently and luridly described’. He mentioned such effects as ‘acute sensitivity to impressions’, ‘disturbance of space–time perception’ and an increase in appetite. Yet he also warned that cannabis was ‘a sensitizer’ and that its effects are ‘not always pleasant’: ‘depression becomes despair, anxiety panic’ (!).

So what, 50 years later, can be said about the health effects of cannabis use and cannabis smoking in particular? Cannabis use has been associated with a range of adverse health effects, and new studies regularly appear that are extending our knowledge of the possible adverse health consequences of cannabis use.

From a review of this growing literature, John Witton argues in this chapter that it still remains difficult to make conclusive statements about the health effects of cannabis. Despite the wealth of available information, there still remains a shortage of robust research from well-designed studies. Moreover, a number of basic hurdles exist that make it difficult to disentangle the effects of cannabis from other drug use and other confounding factors. These methodological problems are compounded by the difficulties of ascertaining dose–response relationships.

Nonetheless, some health problems can be identified. Links between chronic cannabis use and respiratory disease, carcinogenesis and adverse child development after

(!) Burroughs, W. (1956), ‘Letter from a master addict to dangerous drugs’, *British Journal of Addiction* 53(2).



## Cannabis use and physical and mental health

maternal cannabis use have been identified. There has also been a recent increase in research interest examining the association between cannabis use and psychosis and depression. This brief chapter summarises the many hundreds of studies into the health effects of cannabis. It is important to note, however, that new research is emerging in this area at such a pace that any review is likely to become quickly out of date.

So while this chapter represents a snapshot of current knowledge — a recent Spanish monograph (Ramos Atance et al., 2007) covers the subject of cannabis and mental health in further detail — it is likely that the knowledge base on the health effects of cannabis will develop further over the coming years, and any conclusion drawn based on the current evidence must be regarded as tentative.

## Further reading

Advisory Council on the Misuse of Drugs (2008), *Cannabis: classification and public health*, Home Office, London.

Copeland, J. (2006), 'Cannabis use, depression and public health', *Addiction* 101: 1380.

Corrigan, D. (this monograph, Volume 1), 'The pharmacology of cannabis: issues for understanding its use'.

EMCDDA (2007), *Drugs profiles: cannabis*  
[www.emcdda.europa.eu/?nodeid=25484](http://www.emcdda.europa.eu/?nodeid=25484)

Inserm (2001), *Cannabis: Quels effets sur le comportement et la santé?*, Les éditions Inserm, Paris.

Kalant, H., Corrigan, W., Hall, W., Smart, R. (eds) (1999), *The health effects of cannabis*. Addiction Research Foundation, Toronto.

Ramos Atance, J. (ed.) (2007), *Aspectos psiquiátricos del consumo del cannabis*, Sociedad Española de investigación en cannabinoides (SEIC), Madrid.

See also the grey literature list in the Appendix to Volume 1 of this monograph.



# Cannabis use and physical and mental health

John Witton

## Introduction

The health effects of cannabis have been the subject of a number of scientific reviews by national and international bodies since the seminal Indian Hemp Commission of 1893–4. Yet, over a century later, the health effects of cannabis are still regularly debated. Uncertainty about these effects seems to contribute to confused scientific, public and political arguments. This is perhaps a surprising situation, given that there is now no shortage of recent authoritative reviews to draw upon to help weigh up the evidence (Joy et al., 1999; Kalant et al., 1999; Inserm, 2001; Hall and Pacula, 2003; UK Advisory Council on the Misuse of Drugs, 2002; Kalant, 2004; Iversen, 2005). So what makes it so difficult to arrive at a consensus view about the health effects of cannabis?

In his chapter in this monograph, Wayne Hall outlines the factors that prevent us from arriving at the same kind of consensus view of cannabis as we have for alcohol and tobacco. In particular, there is a paucity of good quality studies of cannabis and health effects or long-term studies that enable a careful assessment of the possible causal role of cannabis in the development of a range of health concerns (Macleod et al., 2004).

Analysts seeking to make conclusive statements on the health aspects of cannabis are faced with three major hurdles. The first is the absence of a standardised product. Cannabis cigarettes — ‘joints’ — can contain varying doses of the main psychoactive constituent of cannabis, tetrahydrocannabinol (THC), and many of the studies under review can only provide approximate indicators of the amount of THC consumed. As cannabis is an illicit product, how can we assume, with confidence, that the joint smoked by one consumer is comparable with the next joint, and the next consumer? These issues are further confounded by differences in how the substance is consumed, embracing such aspects as joint construction, other modes of administration (water pipe, vapouriser), intensity of use and frequency of use<sup>(2)</sup>.

<sup>(2)</sup> For a discussion of screening for intensive use, see Beck and Legleye, this monograph. More work is needed on the nature of THC dosage among regular cannabis users and polyconsumption patterns, in particular the simultaneous use of other substances together with cannabis. Nonetheless, some studies on intensive use patterns have been published with European relevance. In the United Kingdom, Atha and Blanchard (1997, 1998) have estimated THC exposure among regular UK users; in Spain, some attempt has been made to divide regular users into ‘pure’ users who use cannabis alone and ‘polyconsumers’ who use cannabis and other illicit drugs (Calafat et al., 2000); in the Netherlands, a recent study examines intensive use of high potency cannabis (Mensinga et al., 2006).



## Cannabis use and physical and mental health

The second hurdle is that cannabis is often consumed with other substances. It is most commonly mixed with tobacco in a joint, and frequently used concurrently with other substances, especially alcohol. Thus, the question arises: ‘how can we disentangle the effects of each substance on the cannabis smoker?’.

A third hurdle is that cannabis use is more common among adolescents and young adults — generally, a physically healthy population — who often give up consuming cannabis before their mid-30s. This, combined with the paucity of long-term studies of cannabis users into middle and old age, means that the precise role played by cannabis in health problems later in life is difficult to determine.

Together, these three hurdles have meant that, although there has been a recent surge in cannabis research adding to the large number of extant studies, it is premature to pronounce conclusively on a range of long-term health concerns surrounding cannabis use.

The research evidence presented in this brief review has been identified according to the standard criteria for causal inference. These criteria imply that evidence should demonstrate that there is a relationship between cannabis use and a health outcome using an accepted type of research design. Thus, studies should have ‘built-in’ trustworthiness and show that:

- through statistical testing, the relationship is unlikely to be due to chance;
- drug use precedes the adverse effect; and
- that the evidence eliminates as far as possible the likelihood that the relationship is due to some other variable that is related to both cannabis use and the adverse health effect.

So this brief review presents the best currently available evidence, together with comments on any shortcomings of this evidence in the light of the above criteria.

## Acute effects of cannabis

The reported effects of acute cannabis use are a sense of euphoria and relaxation, perceptual distortions, time distortion and the intensification of sensory experiences such as listening to music. Cannabis use in social settings can lead to increased talkativeness and infectious laughter followed by states of introspection and dreaminess. The user typically has a feeling of greater emotional and physical sensitivity that can include greater interpersonal empathy. Short-term memory and attention are also impaired (Joy et al., 1999; Hall and Pacula, 2003). Acute subjective effects have been found to be significantly increased according to dose of THC in laboratory studies (Hart et al., 2001).



Cannabis use can increase the heart rate by 20–100% above baseline. This increase is greatest in the first 10–20 minutes after use then decreases rapidly thereafter. The rate of decrease depends on whether smoked or oral cannabis is used, lasting 3 hours in the former and 5 hours in the latter (Joy et al., 1999). Blood pressure is increased while the person is sitting and decreased while standing. The change from sitting to standing can cause faintness and dizziness due to the change in blood pressure. These cardiovascular effects are of negligible clinical significance because most cannabis users are young and healthy and develop tolerance to these effects (Joy et al., 1999; Sidney, 2002).

However, these changes may present serious problems for older users, particularly individuals with pre-existing heart disease (Joy et al., 1999; Sidney, 2002). Cases of acute cardiovascular death in which THC was present in post-mortem blood samples, indicating recent cannabis use, have been reported (Bachs and Morland, 2001). An interview-based study of 3882 patients (1258 women) with recent myocardial infarctions found that the cannabis smokers in the group were 4.8 times more likely to experience a myocardial infarction 1 hour after smoking than during periods of non-use. The small number of 124 cannabis smokers in the study were also more likely to be male, overweight and cigarette smokers, and cannabis was a rare trigger of acute myocardial infarctions in this study group (Mittleman et al., 2001). A longitudinal study of risk factors for coronary artery disease in a group of young adults aged 18–30 did not find an association between cannabis use and cardiovascular risk factors such as elevated cholesterol levels and blood pressure or high body mass index (Rodondi et al., 2006). There have been a small number of case reports of strokes following cannabis use, but further research is needed to determine the relationship of cannabis use to cerebrovascular disease (Moussouttas, 2004).

### Acute mood effects

Adverse mood effects can occur, particularly in inexperienced users, after large doses of cannabis. Anxiety and paranoia are the most common of these effects, which also include depersonalisation, panic, dysphoria (unpleasant mood), depression, delusions, illusions and hallucinations. These effects normally disappear a few hours after cessation of use and are responsive to reassurance and a supportive environment (Adams and Martin, 1996; Joy et al., 1999).

### Acute toxicity

The acute toxicity of cannabis is very low and there is no overdose risk from cannabis. While there have been occasional reports of human deaths suspected of being related to cannabis use, these have not been confirmed by appropriate analytic techniques (Tewari and Sharma, 1980; Hall and Pacula, 2003).

## Chronic effects of cannabis

### Immune system

While cannabis smoking has been found to impair the function of lung macrophages, which provide a defence against inhaled pathogens, there is no conclusive evidence that cannabis impairs immune function to any significant extent (Roth et al., 2004; Kraft and Kress, 2004). The few studies that have suggested that cannabis has an adverse effect on the immune system have not been replicated. Two prospective studies of HIV-positive men have shown that cannabis use is not associated with progression to AIDS (Kaslow et al., 1989; Hollister, 1992; Joy et al., 1999).

### Respiratory system

Cannabis smoke contains many of the same components as tobacco smoke, while having a higher proportion of particulate matter and some carcinogens (Tashkin, 1999). As much as four times the amount of tar can be deposited on the lungs of cannabis smokers as cigarette smokers if a cigarette of comparable weight is smoked. This difference is probably the result of differences in administration. Cannabis smokers usually develop a larger puff volume, inhale more deeply and hold their breath several times longer than tobacco smokers (Wu et al., 1988; Joy et al., 1999).

Chronic cannabis smoking effects are similar to those of tobacco smoking. Regular heavy use of cannabis can produce chronic inflammatory changes in the respiratory tract, resulting in increased symptoms of chronic bronchitis such as coughing, shortness of breath, production of sputum and wheezing (Tashkin et al., 2002). As many cannabis smokers also smoke tobacco, analysis of data from a prospective study of almost 1000 young adults in the Dunedin, New Zealand, birth cohort study (see below) took this possible confounding factor into account in assessing the effects of cannabis and tobacco on lung function. After correcting for the contribution of tobacco smoking, symptoms of bronchitis were 61–144% more frequent in dependent cannabis smokers than in non-smokers (Taylor et al., 2000).

The epidemiological literature on the effect of cannabis on chronic obstructive pulmonary disease (COPD) is inconclusive. In a prospective study involving 990 individuals aged under 40, 'non-tobacco' smoking had a larger effect on respiratory function than tobacco smoking, an effect that was maintained in a follow-up of the sample (Bloom et al., 1987; Sherrill et al., 1991). In contrast, a longitudinal study following groups of cannabis-only smokers, cannabis and tobacco smokers, tobacco-only smokers and a control group found no significant change in lung function in the smoking groups after initial assessments (Tashkin et al., 1987; Tashkin et al., 1997).



Lung function was also examined in the Dunedin birth cohort during the follow-ups at ages 18, 21 and 26. While a correlation was found between the amount of cannabis smoking in this period and a decrease in expiratory flow rate, an indicator of COPD, this correlation became of statistically marginal significance only once the subjects' tobacco use was taken into consideration in the statistical analysis (Taylor et al., 2002). A recent exploratory study with a convenience sample of 339 participants, mainly recruited via the media, found a dose-related impairment of the large airway function, resulting in an obstruction of air flow and causing increased pressure on the lungs, with more adverse effects reported at higher doses (Aldington et al., 2007).

## Carcinogenicity

### Respiratory cancer

There is no conclusive evidence that cannabis causes cancer in humans, including those cancers associated with tobacco use. However, cellular, genetic and human studies suggest that cannabis smoke may be an important risk factor for the development of respiratory cancer. Laboratory studies have found little evidence that THC can cause mutations in bodily cells that may lead to cancer (Hall and MacPhee, 2002). While reviews of laboratory studies have shown that cannabis smoke can produce mutations and cancerous changes, these laboratory studies have typically used doses of the drug larger than those used by humans on a regular basis and indicate the possibility rather than the probability of such changes occurring in humans who smoke cannabis (Kalant, 2004). Biopsy samples taken from a group of crack, cannabis and tobacco smokers found evidence of biochemical and gene alterations — indicators of precancerous change (Barsky et al., 1998). These changes occurred in more of the biopsy samples taken from the smokers, whether the drugs were smoked alone or in combination, than those from the non-smokers.

There is not yet any evidence from controlled studies showing a higher rate of respiratory cancers among chronic cannabis smokers. However, there is evidence of an additive effect of cannabis and tobacco smoking on histopathological abnormalities in lung tissue, similar abnormalities to those that precede lung cancer in tobacco smokers (Joy et al., 1999; Tashkin et al., 2002; Hall and Pacula, 2003). However, several factors militate against cannabis smokers developing lung cancer. Patterns of cannabis use differ to those of cigarette smoking. Cannabis use tends to be time-limited, with most smokers stopping in their early to-mid-20s. Those who do continue their cannabis use tend to smoke 1–3 cannabis cigarettes a day, compared with 10–30 tobacco cigarettes by tobacco smokers. Finally, there are far fewer cannabis smokers than tobacco smokers (Hall and MacPhee, 2002).



## Cannabis use and physical and mental health

There have been case reports of cancers in the aerodigestive tract of young adults with a history of heavy cannabis use. These findings are significant because these kinds of cancers are rarely found in the adults under the age of 60, even among those who smoke tobacco and drink alcohol. This suggests that cannabis smoking may potentiate the effects of other risk factors, such as tobacco smoking, and is a more important risk factor than tobacco and alcohol use in the early development of respiratory cancers (Sridhar et al., 1994; Joy et al., 1999).

Epidemiological studies have provided conflicting evidence for the likelihood of cannabis smokers developing cancers. A cohort of 64 855 members of the Kaiser–Permanente Medical Care Program in California were recruited to a prospective study over a 6-year period. They were asked about their cannabis use on entry into the study and data on cancer incidence among the group were collected from a cancer registry and the California mortality data system (Sidney et al., 1997). The study did not find an excess of cancers among those who used cannabis at the entry to the study or who were current smokers compared with those who did not use cannabis when the study started. While there was a small but significant risk of developing cancer of the prostate in men and cancer of the cervix in women, there was no evidence of a risk of developing tobacco-related cancers. However, with only 22% of the people in the study being current cannabis smokers, the numbers were small and most were also followed up to an average age of 43, too young to find evidence of excess cancers among the cannabis smokers.

A second prospective study at the same centre, this time following 133 811 members over a period of up to 21 years, found that those who smoked cannabis at least once a month had an increased risk of developing malignant primary adult-onset gliomas, tumours most commonly developed in the brain and spinal cord. However, other important risk factors, such as ionising radiation, were not considered in this study (Efirt et al., 2004).

Another epidemiological study retrospectively followed the medical histories of 173 cases of head and neck cancers (upper aerodigestive tract) matched with 176 blood donors at the same hospital without a history of cancer who were matched by age, sex, race, education and alcohol and tobacco use (Zhang et al., 1999). Cancer risk was 2.6 times higher in the cannabis smokers than among the non-smokers, and three times higher in those who were 55 or younger. There was an increase in cancer risk according to increasing frequency and duration of cannabis use. While this study added more weight to the suspicion that cannabis smoke may be linked to cancer, it had a number of methodological limitations, including the small numbers involved in the study and the possible role of other factors not taken into account in the study.

Two other studies failed to find an association between cannabis use and oral cancers (Llewellyn et al., 2004; Rosenblatt et al., 2004). The first, a case-control study of young adults, had only 10% heavy cannabis smokers in its sample of 116 patients. The study by Rosenblatt et al. was a large community-based case-control study with 407 patients and 615 controls aged 18–65. The study found no relation between the risk of oral cancer and ever in lifetime cannabis use or increasing duration and average frequency of use. The authors suggested that the discrepancy between their findings and those of Zhang et al. arose from the low frequency of cannabis use in the control subjects in Zhang's study, while the frequency of cannabis use in the control subjects in their study matched that predicted from population surveys of adults in the USA. However, the study had relatively low participation and may have missed cases who had used cannabis.

A recent study attempting to address the methodological deficiencies of the earlier studies used a population-based case-control design, with 1 209 cancer patients aged between 18 and 59 identified by the Los Angeles County Cancer Surveillance Program, matched to cases on age, gender and neighbourhood. Interview data were collected on lifetime histories of alcohol, tobacco and illicit drug use, socio-demographic factors, diet, family history of cancer and occupational exposures. Cumulative cannabis use was measured in joint-years, where 1 joint-year equalled 365 joints. Preliminary analysis of the data did not find a positive association between cannabis use and lung and aerodigestive tract cancers, with a positive association absent with the long-term heavy smokers as well (Morgenstern et al., 2005). Another recently reported study examined cannabis use in 611 people who had developed lung cancer and 601 people who had developed cancer of the head or neck, matching them on age, gender and neighbourhood with 1 040 people without cancer. Heavy cannabis smokers in this study had smoked more than 22 000 joints, while moderately heavy smokers had smoked between 11 000 and 22 000 joints. Neither group were at increased risk of developing cancer and were not at increased risk compared with those in the study who smoked less cannabis or none at all (Tashkin et al., 2006).

## Childhood cancers

Three studies exploring the risk of cancer in childhood have found evidence of a link with maternal cannabis use during pregnancy. The most notable of these studies found an association between maternal cannabis use and acute non-lymphoblastic leukaemia (ANLL). This case-control study was designed to assess the impact of the parents' environmental exposure to petrochemicals, pesticides and radiation on childhood cancer, with maternal cannabis use recorded as one of the factors included in the analysis. The results showed that mothers of children with the cancers were 11 times more likely to have smoked cannabis than the comparison group. When the rate of cannabis use was adjusted among the control group to bring it up to the level



of other studies of childhood cancer, the risk of cancer was still three times greater (Robinson et al., 1989). In the other two case-control studies, again investigating a range of factors that may have had an impact on childhood cancers, an increased risk of rhabdomyosarcoma and astrocytomas was found in children born to mothers who smoked cannabis during their pregnancy (Kuitjen et al., 1992; Grufferman et al., 1993). However, there is no evidence for an increase in incidence of these cancers over the period 1979–95, which would be expected if maternal cannabis use was a cause of these cancers (Hall and MacPhee, 2002).

## Reproductive system

THC has been found to inhibit reproductive function in the few human studies reported, although these studies have yielded inconsistent evidence. On the basis of research on animals, it has been argued that cannabis would probably decrease fertility for both men and women in the short term (Joy et al., 1999). It has been suggested that the possible effects of cannabis use on spermatogenesis and testosterone may be most significant for those males whose fertility is already impaired, for example those with a low sperm count (Hall and Pacula, 2003).

The results of research studies on the effects of prenatal cannabis use and birth outcome have been small and inconsistent. Some studies have suggested that cannabis smoking in pregnancy may reduce birth weight. Controlled studies, including a recently reported study analysing the records of live births in New South Wales hospitals over a 5-year period, found that this relation remained after controlling for any confounding variables, although this relation has not always been found in other studies (Zuckerman et al., 1989; Joy et al., 1999; Burns et al., 2006). The effects of cannabis smoking where an association has been found are small compared with tobacco (Fried et al., 1998). There is some evidence that gestation is shorter, especially for adolescent mothers (Cornelius et al., 1995; English et al., 1997; Burns et al., 2006). The relative contributions of smoking and THC are not known from the evidence available. Large, well-controlled epidemiological studies have found no evidence that cannabis causes birth defects (Zuckerman et al., 1989).

## Maternal cannabis use and infant development

A review of the consequences of prenatal cannabis exposure found that, while prenatal exposure did not have an impact on global IQ, it did appear to have an impact on aspects of executive function, and, in particular, attentional behaviour and visual analysis/hypothesis testing beyond the infant stage. However, the reviewers draw attention to the limited literature, the small sample sizes and the quasi-experimental

nature of the studies reviewed and urged caution when interpreting the results of their review (Fried and Smith, 2001).

There are two major ongoing longitudinal studies examining prenatal exposure and subsequent effects on growth, cognitive development and behaviour. The first is the Ottawa Prospective Prenatal Study (OPPS), under way since 1978. The sample in this study consists of low-risk, white and predominantly middle-class families. The second study, the Maternal Health Practices and Child Development Study (MHPCD), began in 1982. The study sample is high-risk, with low socioeconomic status and just over half are African American (Goldschmidt et al., 2000).

The OPPS found that there was a developmental delay after birth in the infant's visual system with an increased rate of tremors and startle among the children of cannabis users. These effects had disappeared after 1 month and there were no detectable effects on standardised ability tests at 6 months and 12 months (Fried and Smith, 2001). The cohort has now been followed up to age 13–16 years. Effects were found on memory at age 4, attention at age 6 and visual integration and attention and visual-related aspects of executive function in 9- to 12-year-olds. There was no difference between children who were and were not prenatally exposed to cannabis on global IQ scores but there were differences in tasks that required visual memory, analysis and integration at age 13–16 (Fried et al., 2003).

A recent study from the Pittsburgh MHPCD examined the effects of prenatal cannabis and alcohol exposure on academic achievement at age 10. In contrast to the OPPS, which found no effects of prenatal exposure to cannabis on school performance, use of cannabis in the first trimester was associated with poorer performance on reading and spelling tests and a lower performance evaluation by the children's teachers. Analysis suggested these effects were mediated by the effect of first-trimester use of cannabis on the children's anxiety and depression symptoms. Cannabis use in the second trimester was significantly associated with underachievement in school performance. While a range of factors, including socioeconomic, home environment and maternal prenatal and current drug use, were taken into account in the study, other important factors such as motivation and parental involvement in the child's education did not feature in the statistical analysis (Goldschmidt et al., 2004).

## Premature mortality

The two prospective studies on mortality amongst cannabis smokers are inconclusive. The Swedish study of conscripts showed an increased risk of premature death among those who smoked cannabis 50 or more times before the age of 18. Violence and accidental death were the main causes of death. This association disappeared after



## Cannabis use and physical and mental health

alcohol and other drug use amongst this group were taken into account in the statistical analysis (Andreasson and Allebeck, 1990).

In an American study, regular cannabis use had a small association with premature mortality, which was entirely explained by the increased deaths from AIDS in men in the study. However, only men up to an average age of 43 were included in this study. With cigarette smoking and alcohol only modestly associated with premature mortality, it is too early to conclude from this study that cannabis use does not increase premature mortality (Sidney et al., 1997).

## Cannabis and dependence

The US classification of psychiatric disorders, the Diagnostic and Statistical Manual of Mental Disorders (DSM), lists seven criteria for assessing substance dependence. These criteria are:

- tolerance;
- withdrawal;
- the substance is often taken in larger amounts or over a longer period than was intended;
- there is a persistent desire or unsuccessful attempts to stop or cut down use;
- a great deal of time is spent trying to obtain or use the substance;
- important social, occupational or recreational activities are given up or reduced because of substance use; and
- use is continued despite knowledge that the substance is causing or exacerbating physical or psychological problems.

A diagnosis of substance dependence is given if at least three of these symptoms are experienced in the same 12-month period (American Psychiatric Association, 1994).

Human and animal studies have found that tolerance to many of the physiological and behavioural effects of cannabis develops after repeated exposure to the drug (Adams and Martin, 1996; Joy et al., 1999). A laboratory study in which oral THC was given to human subjects over a 30-day period found a decline in the acute cardiovascular and psychological effects of THC (Jones and Benowitz, 1976). In another laboratory study, tolerance to the subjective effects of cannabis developed after oral administration of a small amount of THC for several days, with greater tolerance developing with increased amounts of THC (Jones, 1983).

Laboratory studies, while using a range of experimental approaches, have identified a number of adverse symptoms associated with withdrawal from cannabis. The most common symptoms include restlessness and nervousness, irritability, loss of appetite and



sleep disturbance. However, the extent to which the pattern of cannabis use contributes to the severity of withdrawal symptoms is undetermined. Most of the laboratory studies have involved heavy daily users as their subjects and the extent to which withdrawal may affect light or non-daily users is unclear (Budney and Hughes, 2006).

Using standardised diagnostic criteria for dependence such as DSM, epidemiological studies have estimated the extent of cannabis dependence in the general population. For example, the US Epidemiologic Catchment Study (ECA) estimated that 4.4% of the US adult population had either abused cannabis or were dependent on it at some point in their life (Robins and Regier, 1991). Seventeen per cent of those in the ECA study who used cannabis more than five times had met DSM-III criteria for dependence at some point in their lives (Anthony and Helzer, 1991). Studies of long-term cannabis users in Australia found a substantial proportion of them were dependent. In a study of 200 young Sydney adults who had used cannabis at least weekly for 11 years, 77% met the DSM-III criteria for dependence in the past year and 40% were classified as severely dependent (Swift et al., 1998).

National drug treatment systems have recorded an increase in the number of people seeking treatment for cannabis problems including dependence (see Montanari et al., this monograph). However, several studies have found that most regular cannabis users discontinue their use of cannabis by their mid-20s. For example, a longitudinal study of US school students found that less than 15% of them were using cannabis daily by the age of 28–29 (Kandel and Davies, 1992). While studies of cannabis users who are unable to discontinue their use with assistance found that they were experiencing impaired functioning and a reduction in the quality of their lives, for the most part those with cannabis dependence seem to be able to remit their cannabis use without treatment (Budney and Moore, 2002; Hall and Pacula, 2003).

## Cannabis and psychosis

There is evidence that large doses of THC can produce an acute psychosis marked by confusion, amnesia, delusions, hallucinations, anxiety, agitation and hypomanic symptoms. Nonetheless, such high THC doses are rare among cannabis smokers, given that they are likely to stop smoking if they experience undesired effects. Cases do exist, however, of high doses following ingestion of cannabis (cannabis cookies, space cake), where the user has less immediate control over THC titration. Such reactions may also occur after heavy cannabis use, or in some instances, after acute cannabis use by sensitive/vulnerable individuals. These effects abate rapidly after discontinuing cannabis use. There is little evidence that cannabis alone produces a psychosis that persists after the period of intoxication in non-vulnerable cannabis users (Joy et al., 1999; Hall and Degenhardt, 2000).



## Cannabis use and physical and mental health

Cannabis has been found to have an adverse effect on the clinical course of schizophrenia. In a Dutch prospective study which assessed patients each month over a year, the 24 people in the cannabis-using group had significantly earlier psychotic relapses than the non-cannabis-using group, an effect that was dose-related (Linszen et al., 1994). Similar findings emerged in a 3-year follow-up community study of psychotic and non-psychotic patients also in the Netherlands. The cannabis users at the beginning of the 3-year study were more likely to have psychotic symptoms and particularly severe ones at follow-up. Those who were diagnosed as psychotic at the beginning of the study had more adverse effects from cannabis use than those who were not psychotic at the start of the study (van Os et al., 2002). In a study that followed up 81 patients in acute psychiatric wards weekly for 6 months, a higher frequency of cannabis use led to more psychotic relapses in the patients, after controlling for other established factors leading to relapse in the statistical analysis (Hides et al., 2006). In contrast, a follow-up study of alcohol- and cannabis-using patients in a psychiatric outpatient continuing care programme in Canada found that symptoms of schizophrenia-spectrum disorders were reduced at 12 months (Margolese et al., 2006).

Findings from national surveys in the USA, Australia and the Netherlands have found higher rates of cannabis use in patients with schizophrenia than the general population. For example, the US National Epidemiological Catchment Area study (Robins and Regier, 1991) indicated that 50% of those identified with schizophrenia also had a diagnosis of substance use disorder (abuse or dependence), compared with 17% of the general population (Regier et al., 1990). People who used cannabis on a daily basis were 2.4 times more likely to report psychotic experiences than non-daily cannabis users, after controlling for a variety of confounding variables such as socio-demographic factors, social role and psychiatric conditions (Tien and Anthony, 1990). A study of cannabis use and psychotic symptoms at age 18 in a cohort of 3 500 Greek adolescents found positive associations between frequency of cannabis use and psychotic experiences after controlling for other drug use and depressive symptoms in the statistical analysis, with a stronger association for those who started their cannabis use before age 15. However, the rates of cannabis use in the study group was low, with 6% reporting lifetime cannabis use and 0.9% reporting daily or near-daily use (Stefanis et al., 2004).

Four main views on the nature of this association have been proposed. Firstly, the link may be due to socio-demographic, economic or genetic factors common to both substance use and schizophrenia. Secondly, the self-medication hypothesis suggests that patients with schizophrenia may be using cannabis and other drugs as a form of self-treatment for their condition. Thirdly, some suggest that cannabis causes psychosis. Finally, the vulnerability hypothesis proposes that the use of cannabis can increase the risk of schizophrenia among people with a predisposition to the illness.







A number of carefully designed prospective studies have helped to assess the value of these hypotheses. These studies have been used to chart the development of a number of psychosocial and behavioural topics, and cannabis is just one issue the datasets have allowed to be explored. The findings from these studies have been summarised in a number of reviews (Arseneault et al., 2004; Smit et al., 2004; Degenhardt and Hall, 2006) and two meta-analyses and one systematic review (Henquet et al., 2005a; Semple et al., 2005; Moore et al., 2007).

### **The Swedish conscript study**

A 15-year prospective study of cannabis use and schizophrenia in 50 465 Swedish military conscripts was the first study to report a potential link between cannabis use and later schizophrenia. The study recruited conscripts who were 18–20 years old in 1969–70. Conscripts who were hospitalised for schizophrenia or psychosis and could be linked to their military medical records were identified. Through this linkage, the relationship between cannabis use and the onset of schizophrenia might be established.

The relative risk for a diagnosis of schizophrenia was 1.3 times higher for those who had used cannabis 1–10 times, three times higher for those who had used cannabis 1–50 times and six times higher for heavy users of cannabis (defined as use on more than 50 occasions) than among those who had not used cannabis. However, over half of the heavy users had had a diagnosis of a psychiatric condition other than psychosis at conscription and when the analysis took this factor into account the relative risk fell to 2.3 (Andreasson et al., 1987; Allebeck, 1991).

A follow-up of the conscripts reported in 2002. Again, heavy cannabis users were found to be 6.7 times more likely than non-users to be at risk of a diagnosis of schizophrenia after 27 years. The risk held when the analysis was carried out on a subsample of conscripts who had used cannabis only. While not an exhaustive array, when other possible confounding factors such as psychiatric diagnosis at conscription, IQ, growing up in a city and cigarette smoking were taken into account the risk, though reduced, still remained, with heavy cannabis users having a threefold relative risk of a diagnosis of schizophrenia (Zammit et al., 2002).

### **The Dunedin Multidisciplinary Health and Development Study**

The Dunedin Study from New Zealand has followed a birth cohort of 1 037 people from the general population born in 1972–3. At age 11 they were examined to identify any self-reported psychotic symptoms before cannabis use may have begun. At 15 and 18 they were examined for self-reported cannabis use, enabling the investigation of the age of onset in relation to later outcomes. At age 26 the subjects were interviewed to



## Cannabis use and physical and mental health

see if they met the criteria of schizophreniform disorder according to DSM-IV diagnostic criteria. A diagnosis of schizophreniform disorder enabled the elimination of psychotic symptoms resulting from being under the influence of alcohol or drugs. Ninety-six per cent of the birth cohort had remained in the study at this point.

Those who used cannabis at ages 15 and 18 had higher rates of psychotic symptoms at age 26 than non-users, a relationship that remained after the analysis controlled for psychotic symptoms predating cannabis use. Those who started using cannabis by the age of 15 showed a fourfold increase in the likelihood of a diagnosis of schizophreniform disorder by the age of 26. The analysis also showed that cannabis use by age 15 did not predict depression at age 26, suggesting the outcome was specific to the cannabis use. The study reported that 10.3% of the 15-year-olds using cannabis received a diagnosis of schizophreniform disorder by the age of 26, compared with 3% of the controls. The number of 15-year-olds smoking cannabis in the study was small, however (Arseneault et al., 2002).

## The Christchurch Health and Development Study

Another New Zealand Study followed a birth cohort of 1 265 people born in Christchurch urban region, with annual measurements up to the age of 16. Additional measurements were taken at age 18, including whether the individuals had a DSM diagnosis of cannabis dependence and whether psychotic symptoms were identified. This examination was repeated at ages 21 and 25. Researchers were able to draw on a sample of 1 055 participants for whom information on cannabis use and psychotic symptoms were available at ages 18, 21 and 25, when 1 011 people remained in the study. Psychosis symptomatology was measured with psychosis items selected from of the symptom checklist as representative of the psychotic symptoms. This study addressed two main questions about the relationship between cannabis and psychosis in its analysis. It attempted to control for residual confounding in its analysis and examine whether reverse causality may be in play, with an increased susceptibility to use cannabis resulting from the individual's psychological state. A wide range of confounding factors were controlled for in the analysis, including family socioeconomic status, family functioning, child abuse including physical punishment, educational achievement and psychotic symptoms at the previous assessment. Analysis also took into account non-observed fixed sources of confounding (Fergusson et al., 2003, 2005).

The results showed that young people using cannabis daily had rates of psychotic symptoms that were between 2.3 and 3.3 times higher than those of non-users. After adjusting the analysis to take into account the confounding factors, this relationship persisted with daily users 1.6–1.8 times more likely to be experiencing rates of psychosis than non-cannabis users. While the study could not control for all possible confounding factors and the diagnostic tools used in the study may not have found all the aspects



of psychosis, the research shows that increasing use of cannabis was associated with increases in the risks of psychotic symptoms, and that the increases in psychotic symptoms were not associated with increased rates of cannabis use, casting doubt on the self-medication hypothesis (Fergusson et al., 2005).

### **The Netherlands Mental Health Survey and Incidence Study (NEMESIS)**

This study followed 7 076 adults aged 18–65 years randomly selected from the Dutch general population, who were examined in 1996, 1997 and 1999. A total of 4 848 people were still in the study at the 1999 follow-up, 4 045 of whom were considered as the 'at-risk' set. The attrition of participants was covered in the analysis of findings from the study. At the 3-year point those who used cannabis at baseline were three times more likely to show psychotic symptoms than non-users. This relationship persisted after controlling for a range of factors in the analysis, such as ethnic group, marital status, educational level and urbanicity. The study also found a dose–response relationship, with the highest risk of psychotic symptoms amongst those who used cannabis more frequently at the beginning of the study. Lifetime history of cannabis at baseline was a stronger predictor of later psychosis than cannabis use at follow-up, suggesting that the relationship between cannabis use and psychosis is not simply one resulting from a short-term psychotic episode (van Os et al., 2002).

### **The early developmental stages of psychopathology (EDSP) study**

The EDSP study examined the prevalence, incidence, risk factors and 4-year course of mental disorders in a random representative sample of adolescents and young adults aged 14–24 in Munich. The baseline survey with 3 021 participants was conducted in 1995, with follow-up data for 2 437 participants in 1999. After adjusting for a range of factors in the analysis, cannabis use at baseline moderately increased the risk of psychotic symptoms at follow-up. The effect of cannabis was stronger for those with any predisposition for psychosis at baseline than those without, with a dose–response relation with increasing frequency of use. Predisposition to psychosis did not predict cannabis use at follow-up in the analysis, suggesting that the cannabis was not used as self-medication in this group (Henquet et al., 2005b).

## **What is the relationship between cannabis and psychosis?**

While these various studies used a range of methodologies, measurements of cannabis use and psychosis and, in the cases of the Dunedin and NEMESIS studies, were marked



by small sample sizes, there was some consistency in the risk of developing psychosis after cannabis use across all the populations studied. The Moore et al. meta-analysis concluded that those who had ever used cannabis were 40% more likely to experience a psychotic outcome than non-users and regular cannabis use increased the chances of developing later schizophrenia or schizophrenia-like psychotic illness by approximately two- to threefold (Arseneault et al., 2004; Henquet et al., 2005a; Semple et al. 2005; Moore et al., 2007). In the Dunedin study, those who started their cannabis use by age 15 had a higher risk of developing schizophreniform disorder by age 26 than those who started at age 18, suggesting that early cannabis use may provide higher risk of psychosis outcomes (Arseneault et al., 2002). The analysis from the Christchurch population study has gone the furthest in terms of controlling for a wide range of possible confounding demographic, social and individual factors in their analysis, suggesting that the association between cannabis use and psychosis in the study population is unlikely to be due to confounding factors (Fergusson et al., 2005). The analysis also suggested that the direction of causality was from cannabis to psychosis.

With the Christchurch and other studies eliminating the self-medication hypothesis, the studies also eliminated the idea that other drugs may be involved and found that cannabis makes its own unique contribution to the development of later schizophrenia or psychotic symptoms.

### **The significance of the relationship between cannabis and schizophrenia to public health**

However, the increased rates of cannabis use in the last 30 years have not been accompanied by a corresponding increase in the rates of psychosis in the population (Degenhardt et al., 2003a). The studies reviewed here suggest that cannabis is a modest statistical risk factor, with studies calculating that 6–8% of schizophrenia could be prevented if cannabis use was removed from the general population of adolescents and young adults (Arseneault et al., 2004; Henquet et al., 2005b). The vast majority of young cannabis smokers do not develop psychosis, and this supports the hypothesis that a small minority of users may be vulnerable to the effects of cannabis and time of onset to psychotic illness. The vulnerability hypothesis has received some support from a study that explored substance use and psychotic experiences in daily life. The acute effects of cannabis were stronger among participants with high vulnerability for psychosis (experiencing at least one bizarre psychotic symptom or at least two non-bizarre symptoms over the first month). Those vulnerable participants reported increased levels of perceived hostility and unusual perceptions, and also decreased levels of pleasure associated with the experience of using cannabis (Verdoux et al., 2003). That cannabis is a risk factor for earlier onset is further supported by a study examining first-episode psychosis in the Netherlands, which found that cannabis users in the group presented



to treatment earlier than non-users, with a median age difference of 7.5 years (Veen et al., 2004). Adding further weight to the strength of the vulnerability hypothesis is a recent study that examined a gene–environment interaction in the Dunedin population, finding that a gene called COMT moderated the influence of adolescent cannabis use on developing adult psychosis in the Dunedin population, a finding also reported in an experimental setting (Caspi et al., 2005; Henquet et al., 2006). However, this interaction was reported only in a small subgroup of participants in each study and awaits further replication.

## Cannabis and depression and anxiety

There have been a number of case reports of panic reactions after cannabis use. In a survey of 1 000 young adults in New Zealand, acute anxiety and panic was the most common psychiatric problem reported by cannabis smokers in the study (Thomas, 1996). Lifetime cannabis dependence, measured using DSM criteria, was significantly related to an increased risk of panic attacks in a large statewide randomly sampled household survey conducted in the USA (Zvolensky et al., 2006). National population studies have found evidence for a link between cannabis use and depression. A study of a nationally representative sample of 7 000 adults aged 15–45 in the USA found a small increased risk of depression among the current users of cannabis (Chen et al., 2002). Another study of a nationally representative sample of 40- to 50-year-olds in the USA found a small increased risk, but one that was associated with earlier onset of cannabis use rather than current use (Green and Ritter, 2000). A national population study in Australia found that cannabis users were between two and three times more likely to meet criteria for a mood disorder than non-users. Prevalence of mood disorders increased from 6% in non-users to 14% of those who met criteria for cannabis dependence (Degenhardt et al., 2001).

A meta-analysis of cohort studies found a modest but significant association between early onset heavy use of cannabis and later depression but no evidence that depression increased the probability of later use of cannabis (Degenhardt et al., 2003b). For example, a follow-up study of participants with no depressive symptoms at the beginning of the Epidemiologic Catchment Area study found that those with a diagnosis of cannabis abuse at baseline were four times more likely than those without a cannabis abuse diagnosis to have depressive symptoms at follow-up (Bovasso, 2001). In a longitudinal study of a representative sample of 1 601 secondary school students in the Australian state of Victoria, weekly or more frequent use led to a doubling of the risk for later anxiety or depression by the age of 20, while female daily users had a fivefold increase in later depression and anxiety (Patton et al., 2002). Depression and anxiety in the students did not predict later cannabis use in the analysis, suggesting that cannabis was not used for self-medication. However, findings from the smaller New Zealand



## Cannabis use and physical and mental health

Dunedin sample indicated that those in the sample using cannabis by age 15 did not have a significantly higher risk of later depression by the age of 26 than non-users did, although the sample size may have prevented the identification of a relationship in the statistical analysis (Arseneault et al., 2002). In a follow-up study of the New Zealand Christchurch sample, the analysis controlled for a range of confounding factors that might explain the association between cannabis and a range of psychosocial outcomes including depression and suicide attempts. The link between cannabis and these outcomes and heavy (at least weekly) cannabis use still persisted, suggesting that cannabis was contributing directly to these outcomes (Fergusson et al., 2002). A recent analysis of data from the ongoing National Longitudinal Survey of Youth of 1979 with a large cohort of 12 686 men and women born between 1957 and 1964 did not find that past-year cannabis use predicted later development of depression (Harder et al., 2006). However, the study group may have been too old and restricted in age range for the relatively low level of their cannabis use to result in significant symptoms of depression (Copeland, 2006). Overall, a recent meta-analysis has concluded that the majority of studies of cannabis and affective mental health problems have not adequately addressed the issue of reverse causation, and the evidence for a link is not strong (Moore et al., 2007).

## Impact of increased potency of cannabis

High-THC cannabis is reported to have become increasingly available, although the published evidence for this is scant (Hall and Swift, 2000; King et al., 2005). This may reflect an increased market for more potent cannabis amongst regular users and improved methods of growing high-potency cannabis. The health implications of this development are unclear. Those who use these high-potency products may increase their risks of developing respiratory disease or experiencing psychotic symptoms (Hall and Pacula, 2003). However, regular users may be able to titrate their dose and decrease the risks of respiratory disease, and naive users who experience adverse effects may be deterred from further cannabis use (Hall and Pacula, 2003). As yet, there is insufficient evidence to inform a conclusive view of the risks to health posed by high-potency cannabis (King et al., 2005).

## Conclusion

Most cannabis users cease smoking cannabis by their late 20s or early 30s and the vast majority do not experience any adverse effects from their use. A minority continue their use into middle age, and such long-term heavy users have reported a range of negative health effects (Reilly et al., 1998; Gruber et al., 2003). However, the causal role of cannabis in the development of negative physical and mental health problems for some users remains uncertain and in need of further investigation. Recent research



has provided more information on the involvement of cannabis in the development of psychiatric disorders such as depression and psychosis in vulnerable people, or bronchial problems resulting from cannabis smoke. But more research work is needed to address the precise role of cannabis in health-related problems and the broad research agenda for cannabis remains much the same as 30 years ago.

## References

- Adams, I., Martin, B. (1996), 'Cannabis: pharmacology and toxicology in animals and humans', *Addiction* 91: 1585–1614.
- Aldington, S., Williams, M., Nowitz, M., Weatherall, M., Pritchard, A., McNaughton, A., Robinson, G., Beasley, R. (2007), 'Effects of cannabis on pulmonary structure, function and symptoms', *Thorax*: 1–7.
- Allebeck, P. (1991), 'Cannabis and schizophrenia: is there a causal association?' in Nahas, G. G., Latour, C. (eds), *Physiopathology of illicit drugs: cannabis, cocaine, opiates*, Pergamon Press, Oxford.
- APA (1994), *Diagnostic and statistical manual of mental disorders*, American Psychiatric Association, Washington DC.
- Andreasson, S., Allebeck, P. (1990), 'Cannabis and mortality among young men: a longitudinal study of Swedish conscripts', *Scandinavian Journal of Social Medicine* 18: 9–15.
- Andreasson, S., Allebeck, P., Engstrom, A., Rydberg, U. (1987), 'Cannabis and schizophrenia: a longitudinal study of Swedish conscripts', *Lancet* 2: 1483–1486.
- Anthony, J. C., Helzer, J. E. (1991), 'Syndromes of drug abuse and dependence', in Robins, L. N., Regier, D. A. (eds), *Psychiatric disorders in America: the epidemiologic catchment area study*, Free Press, New York, 116–154.
- Arseneault, L., Cannon, M., Poulton, R., Murray, R., Caspi, A., Moffitt, T. (2002), 'Cannabis use in adolescence and risk for adult psychosis: longitudinal prospective study', *British Medical Journal* 325: 1212–1213.
- Arseneault, L., Cannon, M., Witton, J., Murray, R. (2004), 'Causal association between cannabis and psychosis: examination of the evidence', *British Journal of Psychiatry* 184: 110–117.
- Atha, M., Blanchard, S. (1997), *Regular users: self-reported drug consumption patterns and attitudes towards drugs among 1333 regular cannabis users*, Independent Drug Monitoring Unit (IDMU), Wigan.
- Atha, M., Blanchard, S. (1998), 'Consumption patterns of regular cannabis users', in *Written evidence for the House of Lords Science and Technology Select Committee, Sub-committee I: cannabis, submission of the Independent Drug Monitoring Unit*, Independent Drug Monitoring Unit (IDMU), Wigan.
- Bachs, L., Morland, H. (2001), 'Acute cardiovascular fatalities following cannabis use', *Forensic Science International* 124: 200–203.
- Barsky, S., Roth, M., Kleerup, E., Simmons, M., Tashkin, D. (1998), 'Histopathologic and molecular alterations in bronchial epithelium in habitual smokers of marijuana, cocaine and/or tobacco', *Journal of the National Cancer Institute* 90: 1198–1205.
- Bloom, J., Kaltenhorn, W., Paoletti, P., Camilli, A., Lebowitz, M. (1987), 'Respiratory effects of non-tobacco cigarettes', *British Medical Journal* 295: 1516–1518.
- Bovasso, G. (2001), 'Cannabis abuse as a risk factor for depressive symptoms', *American Journal of Psychiatry* 158: 2033–2037.
- Budney, A., Hughes, J. (2006), 'The cannabis withdrawal syndrome', *Current Opinion in Psychiatry* 19: 233–238.



- Budney, A., Moore, B. (2002), 'Development and consequences of cannabis dependence', *Journal of Clinical Pharmacology* 42: 28S–33S.
- Burns, L., Mattick, R., Cooke, M. (2006), 'The use of record linkage to examine illicit drug use in pregnancy', *Addiction* 101: 873–882.
- Calafat, A., Fernández, C., Becoña, E., Gil, E., Juan, M., Torres, M. (2000), 'Consumo y consumidores de cannabis en la vida recreativa', in Calafat, A., Bobes, J. (eds), *Monografía cannabis*, Plan Nacional sobre Drogas, Madrid.
- Caspi, A., Moffitt, T., Cannon, M., McClay, J., Murray, R., Harrington, H., Taylor, A., Arseneault, L., Williams, B., Braithwaite, A., Poulton, R., Craig, I. W. (2005), 'Moderation of the effect of adolescent-onset cannabis use on adult psychosis by a functional polymorphism in the catechol-O-methyltransferase gene: longitudinal evidence of a gene-environment interaction', *Biological Psychiatry* 57: 1117–1127.
- Chen, C.Y., Wagner, F., Anthony, J. (2002), 'Marijuana use and the risk of major depressive episode. Epidemiological evidence from the United States National Comorbidity Survey', *Social Psychiatry and Psychiatric Epidemiology* 37: 199–206.
- Copeland, J. (2006), 'Cannabis use, depression and public health', *Addiction* 101: 1380.
- Cornelius, M., Taylor, P., Geva, D., Day, N. (1995), 'Prenatal tobacco and marijuana use among adolescents: effects on offspring, gestational age, growth and morphology', *Pediatrics* 95: 738–743.
- Degenhardt, L., Hall, W. (2006), 'Is cannabis use a contributory cause of psychosis?', *Canadian Journal of Psychiatry* 51: 566–574.
- Degenhardt, L., Hall, W., Lynskey, M. (2001), 'The relationship between cannabis use, depression and anxiety among Australian adults: findings from the National Survey of Mental Health and Well-Being', *Social Psychiatry and Psychiatric Epidemiology* 36: 219–227.
- Degenhardt, L., Hall, W., Lynskey, M. (2003a), 'Testing hypotheses about the relationship between cannabis use and psychosis', *Drug and Alcohol Dependence* 71: 37–48.
- Degenhardt, L., Hall, W., Lynskey, M. (2003b), 'Exploring the association between cannabis use and depression', *Addiction* 98: 1493–1504.
- Efirt, J., Friedman, G., Sidney, S., Klatsky, A., Habel, L., Udaltsova, N., Van Den Eden, S., Nelson, L. (2004), 'The risk for malignant primary adult-onset glioma in a large multiethnic mamanger-care cohort: cigarette smoking and other lifestyle behaviors', *Journal of Neuro-oncology* 68: 57–69.
- English, D., Hulse, G., Milne, E., Holman, C., Bower, C. (1997), 'Maternal cannabis use and birth weight: a meta-analysis', *Addiction* 92: 1553–1560.
- Fergusson, D. M., Horwood, L. J., Swain-Campbell, N. (2002), 'Cannabis use and psychosocial adjustment in adolescence and young adulthood', *Addiction* 97: 1123–1135.
- Fergusson, D. M., Horwood, L. J., Swain-Campbell, N. R. (2003), 'Cannabis dependence and psychotic symptoms in young people', *Psychological Medicine* 33: 15–21.
- Fergusson, D. M., Horwood, L. J., Ridder, E. M. (2005), 'Tests of causal linkages between cannabis use and psychotic symptoms', *Addiction* 100: 354–366.
- Fried, P. A., Smith, A. M. (2001), 'A literature review of the consequences of prenatal exposure: an emerging theme of a deficiency in aspects of executive function', *Neurotoxicology and Teratology* 23: 1–11.
- Fried, P.A., Watkinson, B., Gray, R. (1998), 'Differential effects on cognitive functioning in 9- to 12-year-olds prenatally exposed to cigarettes and marihuana'. *Neurotoxicology and Teratology* 20: 293–306.
- Fried, P. A., Watkinson, B., Gray, R. (2003), 'Differential effects on cognitive functioning in 13- to 16-year-olds prenatally exposed to cigarettes and marihuana', *Neurotoxicology and Teratology* 25: 427–436.
- Goldschmidt, L., Day, N. L., Richardson, G. (2000), 'Effects of prenatal marijuana exposure on child behavior problems at age 10', *Neurobehavior and Toxicology* 22: 325–336.





- Goldschmidt, L., Richardson, G., Cornelius, M., Day, N. (2004), 'Prenatal marijuana and alcohol exposure and academic achievement at age 10', *Neurotoxicology and Teratology* 26: 521–532.
- Green, B. E., Ritter, C. (2000), 'Marijuana use and depression', *Journal of Health and Social Behavior* 41: 40–49.
- Gruber, A., Pope, H., Hudson, J., Yurgelin-Todd, D. (2003), 'Attributes of long-term heavy cannabis users: a case–control study', *Psychological Medicine* 33: 1415–1422.
- Grufferman, S., Schwartz, A., Ruymann, F., Maurer, H. (1993), 'Parents' use of cocaine and marijuana and increased risk of rhabdomyosarcoma in their children', *Cancer Causes and Control* 4: 217–224.
- Hall, W., Degenhardt, L. (2000), 'Cannabis use and psychosis: a review of clinical and epidemiological evidence', *Australian and New Zealand Journal of Psychiatry* 34: 26–34.
- Hall, W., MacPhee, D. (2002), 'Cannabis and cancer', *Addiction* 97: 243–247.
- Hall, W., Pacula, R. (2003), *Cannabis use and dependence: public health and public policy*, Cambridge University Press, Cambridge.
- Hall, W., Swift, W. (2000), 'The THC content of cannabis in Australia: evidence and policy implications', *Australian and New Zealand Journal of Public Health* 24: 503–508.
- Harder, V. S., Morral, A. R., Arkes, J. (2006), 'Marijuana use and depression among adults: testing for causal association', *Addiction* 101: 1463–1472.
- Hart, C. L., van Gorp, W., Haney, M., Foltin, R. W., Fischman, M. W. (2001), 'Effects of acute smoked marijuana on complex cognitive performance', *Neuropharmacology* 25: 757–765.
- Henquet, C., Murray, R., Linszen, D., van Os, J. (2005a), 'The environment and schizophrenia: the role of cannabis use', *Schizophrenia Bulletin* 31: 608–612.
- Henquet, C., Krabbendam, L., Spauwen, J., Kaplan, C., Lieb, R., Wittchen, H.-U., van Os, J. (2005b), 'Prospective cohort study of cannabis use, predisposition for psychosis, and psychotic symptoms in young people', *British Medical Journal* 330: 11–14.
- Henquet, C., Rosa, A., Krabbendam, L., Papiol, S., Fananás, L., Drukker, M., Ramaekers, J., van Os, J. (2006), 'An experimental study of catechol-o-methyltransferase Val158Met moderation of delta-9-tetrahydrocannabinol-induced effects on psychosis and cognition', *Neuropsychopharmacology* 12: 48–57.
- Hides, L., Dawe, S., Kavanagh, D. J., Young, R. M. (2006), 'Psychotic symptom and cannabis relapse in recent-onset psychosis', *British Journal of Psychiatry* 189: 137–143.
- Hollister, L. (1992), 'Marijuana and immunity', *Journal of Psychoactive Drugs* 24: 159–163.
- Inserm (2001), *Cannabis: Quels effets sur le comportement et la santé?*, Les éditions Inserm, Paris.
- Iversen, L. (2005), 'Long-term effects of exposure to cannabis', *Current Opinion in Pharmacology* 5: 69–72.
- Jones, R. T. (1983), 'Cannabis tolerance and dependence', in Fehr, K. O., Kalant, H. (eds), *Cannabis and health hazards*, Addiction Research Foundation, Toronto, 617–689.
- Jones R. T., Benowitz N. L. (1976), 'The 30 day trip: clinical studies of cannabis tolerance and dependence', in Braude, C., Szara, S. (eds), *Pharmacology of marijuana*, Raven Press, New York, 627–642.
- Joy, J., Watson, S., Benson, J. (eds) (1999), *Marijuana and medicine: assessing the evidence base*, National Academy Press, Washington.
- Kalant, H. (2004) 'Adverse effects of cannabis on health: an update of the literature since 1996', *Progress in Neuro-Psychopharmacology and Biological Psychiatry* 28: 849–863.
- Kalant, H., Corrigal, W., Hall, W., Smart, R. (eds) (1999), *The health effects of cannabis*, Addiction Research Foundation, Toronto.
- Kandel, D. B., Davies M. (1992), 'Progression to regular marijuana involvement: phenomenology and risk factors for near-daily use', in Glantz, M. D. (ed.), *Vulnerability to drug abuse*, American Psychological Association, Washington DC, 211–253.



## Cannabis use and physical and mental health

- Kaslow, R. A., Blackwelder, W. C., Ostrow, D. G. (1989), 'No evidence for a role of alcohol or other psychoactive drugs in accelerating immunodeficiency in HIV-1 positive individuals: a report from the Multicentre AIDS Cohort Study', *Journal of the American Medical Association* 261: 3424–3429.
- King, L., Carpentier, C., Griffiths, P. (2005), 'Cannabis potency in Europe', *Addiction* 100: 884–886.
- Kraft, B., Kress, H. G. (2004), 'Cannabinoids and the immune system: of men, mice and cells', *Schmerz* 18: 203–210.
- Kuitjen, R. R., Bunin, G. R., Nass, C. C., Meadows, A. T. (1992), 'Parental occupation and childhood astrocytoma', *Cancer Research* 52: 782–786.
- Linszen, D. H., Dingemans, P. M., Lenior, M. E. (1994), 'Cannabis abuse and the course of recent onset schizophrenic disorders', *Archives of General Psychiatry* 51: 273–279.
- Llewellyn, C. D., Linklater, K., Bell, J. (2004), 'An analysis of risk factors for oral cancer in young people: a case-control study', *Oral Oncology* 40: 304–313.
- Macleod, J., Oakes, R., Copello, A., Crome, I., Egger, M., Hickman, M., Oppenkowski, T., Stokes, H., Davey Smith, G. (2004), 'Psychological and social sequelae of cannabis and other illicit drug use by young people: a systematic review of longitudinal, general population studies', *Lancet* 363: 1579–1588.
- Margolese, H. C., Negrete, J. C., Tempier, R., Gill, K. (2006), 'A 12-month prospective follow-up study of patients with schizophrenia-spectrum disorders and substance abuse: changes in psychiatric symptoms and substance use', *Schizophrenia Research* 83: 65–75.
- Mensinga, T., de Vries, I., Kruidenier, M., Hunault, C., van den Hengel-Koot, C., Fijen, M., Leenders, M., Meulenbelt, J. (2006), *Dubbel-blind, gerandomiseerd, placebogecontroleerd, 4-weg gekruist onderzoek naar de farmacokinetiek en effecten van cannabis*, RIVM rapport 267002001/2006, Bilthoven.
- Mittleman, M. A., Lewis, R. A., MacLure, M., Sherwood, J. B., Muller, J. E. (2001), 'Triggering myocardial infarction by marijuana', *Circulation* 103: 2805–2809.
- Moore, T. H. M., Zammit, S., Lingford-Hughes, A., Barnes, T. R. E., Jones, P. B., Burke, M., Lewis, G. (2007), 'Cannabis use and risk of psychotic or affective mental health outcomes: a systematic review', *Lancet* 370: 319–328.
- Morgenstern, H., Greenland, S., Zhang, Z-F., Cozen, W., Mack, T. M., Tashkin, D. P. (2005), Marijuana use and cancers of the lung and upper aerodigestive tract: results of a case-control study', in International Cannabinoid Research Society. *2005 Symposium on the Cannabinoids*, ICRS, Burlington, VT, 49.
- Moussouttas, M. (2004), 'Cannabis use and cerebrovascular disease', *The Neurologist* 10: 47–53.
- Patton, G. C., Coffey, C., Carlin, J. B., Degenhardt, L., Lynskey, M., Hall, W. (2002), 'Cannabis use and mental health in young people: cohort study', *British Medical Journal* 325: 1195–1198.
- Regier, D., Farmer, M. E., Rae, D. S. (1990), 'Comorbidity of mental disorders with alcohol and other drug abuse: results from the epidemiologic catchment area (ECA) study', *Journal of the American Medical Association* 264: 2511–2518.
- Reilly, D., Didcott, P., Swift, W., Hall, W. (1998), 'Long-term cannabis use: characteristics of users in an Australian rural area', *Addiction* 93: 837–846.
- Robins, L. N., Regier, D. A. (1991), *Psychiatric disorders in America: the epidemiologic catchment area study*, Free Press, New York.
- Robinson, L., Buckley, J., Daigle, A., Wells, R., Benjamin, D., Arthur, D. C., Hammond, G. D. (1989), 'Maternal drug use and the risk of childhood nonlymphoblastic leukemia among offspring; an epidemiologic investigation implicating marijuana', *Cancer* 63: 1904–1911.
- Rodondi, N., Pletcher, M. J., Liu, K., Hulley, S. B., Sidney, S. (2006), 'Marijuana use, diet, Body Mass Index, and cardiovascular risk factors (from the CARDIA study)', *American Journal of Cardiology* 98: 478–484.

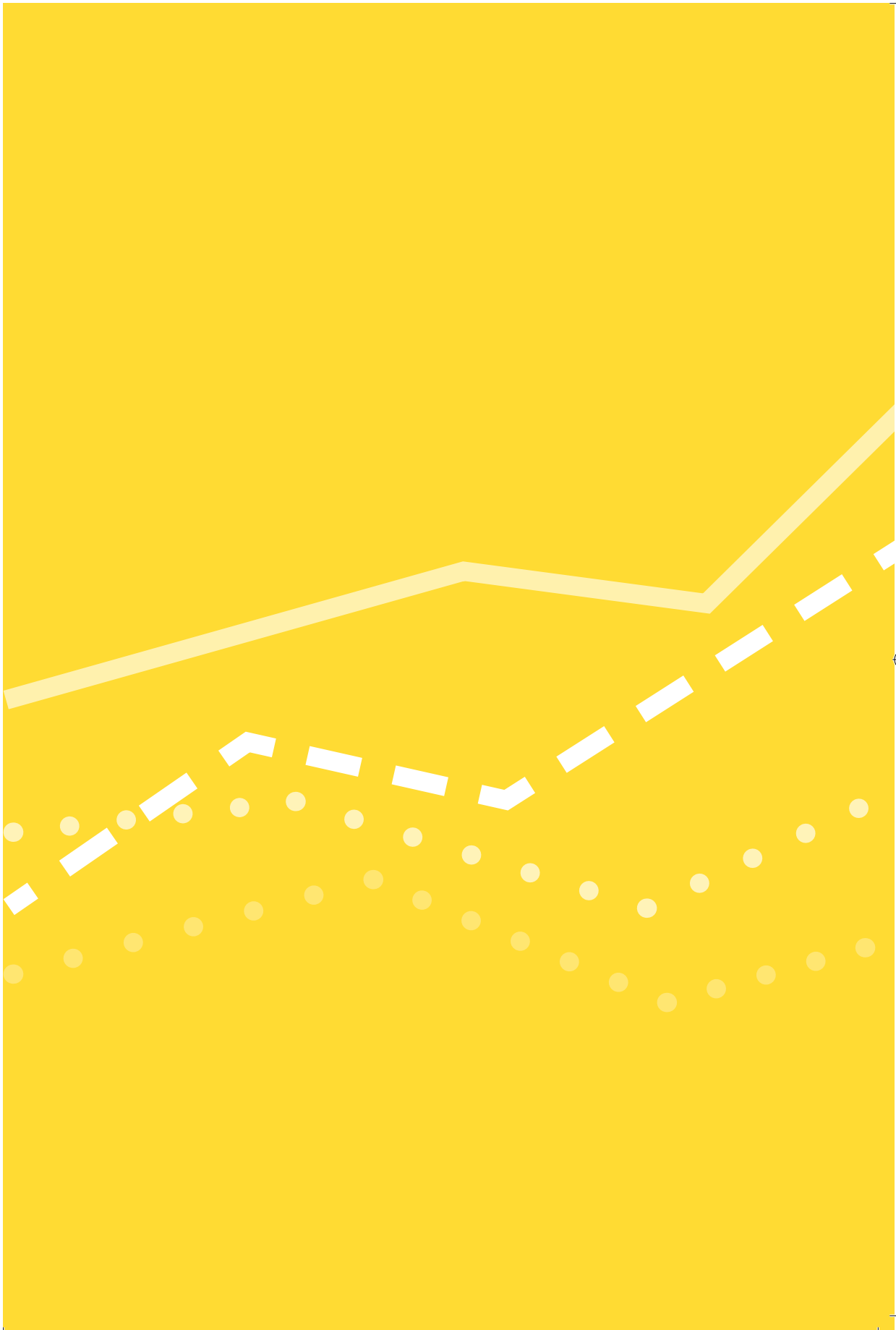


- Rosenblatt, K., Daling, J. R., Chen, C., Sherman, K. J., Schwartz, S. M. (2004), 'Marijuana use and risk of oral squamous cell carcinoma', *Cancer Research* 64: 4049–4054.
- Roth, M. D., Whittaker, K., Salehi, K., Tashkin, D. P., Baldwin, G. C. (2004), 'Mechanisms for impaired effector function in alveolar macrophages from marijuana and cocaine smokers', *Journal of Neuroimmunology* 147: 82–86.
- Semple, D. M., McIntosh, A. M., Lawrie, S. M. (2005), 'Cannabis as a risk factor for psychosis: systematic review', *Journal of Psychopharmacology* 19: 187–194.
- Sherrill, D. I., Krzyzanowski, M., Bloom, J. W., Lebowitz, M. D. (1991), 'Respiratory effects of non-tobacco cigarettes: a longitudinal study in general population', *International Journal of Epidemiology* 20: 132–137.
- Sidney, S. (2002), 'Cardiovascular consequences of marijuana use', *American Journal of Clinical Pharmacology* 42: 64–70.
- Sidney, S., Beck, J. E., Tekawa, I. S., Quesenberry, C. P., Friedman, G. D. (1997), 'Marijuana use and mortality', *American Journal of Public Health* 87: 585–590.
- Smit, F., Bolier, L., Cuijpers, P. (2004), 'Cannabis use and the risk of later schizophrenia', *Addiction* 99: 425–430.
- Sridhar, J. S., Raub, W. A., Weatherby, N. L. (1994), 'Possible role of marijuana smoking as a carcinogen in the development of lung cancer at a young age', *Journal of Psychedelic Drugs* 26: 285–288.
- Stefanis, N. C., Delespaul, P., Henquet, C., Bakoula, C., Stefanis, C. N., van Os, J. (2004), 'Early adolescent cannabis exposure and positive and negative dimensions of psychosis', *Addiction* 99: 1333–1341.
- Swift, W., Copeland, J., Hall, W. (1998), 'Choosing a diagnostic cut-off for cannabis dependence', *Addiction* 93: 1681–1692.
- Tashkin, D. (1999), 'Effects of cannabis on the respiratory system', in Kalant, H., Corrigal, W., Hall, W., Smart, R. (eds), *The health effects of cannabis*, Addiction Research Foundation, Toronto, 311–345.
- Tashkin, D. et al. (2006), 'Marijuana use and lung cancer: results of a case-control study', in the American Thoracic Society, *Proceedings from the 2006 annual meeting, presented May 23, 2006*.
- Tashkin, D. P., Coulson, A. H., Clark, V. A., Simmons, M., Borque, L. B., Duann, S., Spivey, G., Gong, H. (1987), 'Respiratory symptoms and lung function in habitual heavy smokers of marijuana alone, smokers of marijuana and tobacco, smokers of tobacco alone, and non-smokers', *American Review of Respiratory Disease* 135: 209–216.
- Tashkin, D. P., Simmons, M. S., Sherrill, D. I., Coulson, A. H. (1997), 'Heavy habitual marijuana smoking does not cause an accelerated decline in FEV1 with age', *American Journal of Respiratory and Critical Care Medicine* 155: 141–148.
- Tashkin, D. P., Baldwin, G. C., Sarafian, T., Dubinett, S., Roth, M. D. (2002), 'Respiratory and immunologic consequences of marijuana smoking', *Journal of Clinical Pharmacology* 42: 71–81.
- Taylor, D. R., Poulton, R., Moffitt, T. E., Ramankutty, P., Sears, M. R. (2000), 'The respiratory effects of cannabis dependence in young adults', *Addiction* 95: 1669–1677.
- Taylor, D. R., Ferguson, D. M., Milne, B. J., Horwood, L. J., Moffitt, T. E., Sears, M., Poulton, R. (2002), 'A longitudinal study of the effects of tobacco and cannabis exposure in young adults', *Addiction* 97: 1055–1061.
- Tewari, S. N., Sharma, J. D. (1980), 'Detection of delta-9-tetrahydrocannabinol in the organs of a suspected case of cannabis smoking', *Toxicology Letters* 5: 279–281.
- Thomas, H. (1996), 'A community survey of the adverse effects of cannabis use', *Drug and Alcohol Dependence* 42: 201–207.



## Cannabis use and physical and mental health

- Tien, A. Y., Anthony, J. C. (1990), 'Epidemiological analysis of alcohol and drug use as risk factors for psychotic experiences', *Journal of Nervous and Mental Disease* 178: 473–480.
- UK Advisory Council on the Misuse of Drugs (2002), *The classification of cannabis under the Misuse of Drugs Act 1971*, Home Office, London.
- van Os, J., Bak, M., Hanssen, M., Bijl, R. V., de Graaf, R., Verdoux, H. (2002), 'Cannabis use and psychosis: a longitudinal population-based study', *American Journal of Epidemiology* 156: 319–327.
- Veen, N. D., Selten, J. P., van der Tweel, I., Feller, W. G., Hoek, H. W., Kahn, R. S. (2004), 'Cannabis use and age of onset of schizophrenia', *American Journal of Psychiatry* 161: 501–506.
- Verdoux, H., Gindre, C., Sorbara, F., Tournier, M., Swendsen, J. D. (2003), 'Effects of cannabis and psychosis vulnerability in daily life: an experience sampling test study', *Psychological Medicine* 33: 23–32.
- Wu, T. C., Tashkin, D. P., Djahed, B., Rose, J. E. (1988), 'Pulmonary hazards of smoking marijuana as compared with tobacco', *New England Journal of Medicine* 318: 347–351.
- Zammit, S., Allebeck, P., Andreasson, S., Lundberg, I., Lewis, G. (2002), 'Self reported cannabis use as a risk factor for schizophrenia in Swedish conscripts of 1969: historical cohort study', *British Medical Journal* 325: 1199–1201.
- Zhang, Z.-F., Morgenstern, H., Spitz, M. R., Tashkin, D. P., Yu, G.-P., Marshall, J. R., Hsu, T. C., Schantz, S. P. (1999), 'Marijuana use and increased risk of squamous cell carcinoma of the head and neck', *Cancer Epidemiol Biomarkers Prev* 8: 1071–1078.
- Zuckerman, B., Frank, D. A., Hingson, R. Amaro, H., Levenson, S. M., Kayne, H., Parker, S., Vinci, R., Aboagye, K., Fried, L. E. Cabral, H., Timperi, R., Bauchner, H. (1989), 'Effects of maternal marijuana use on fetal growth', *New England Journal of Medicine* 320: 762–768.
- Zvolensky, M. J., Bernstein, A., Sachs-Ericsson, N., Schmidt, N. B., Buckner, J. D., Bonn-Miller, M. O. (2006), 'Lifetime associations between cannabis use, abuse, and dependence and panic attacks in a representative sample', *Journal of Psychiatric Research* 40: 477–486.







## Chapter 7

# The public health significance of cannabis in the spectrum of psychoactive substances

**Keywords:** cannabis – DALY – economics – health – mental health – public health

### Setting the context

There has been a growth in interest in measuring and quantifying the public health impact of specific health issues, from influenza outbreaks, through obesity, tobacco smoking and heart disease, to behavioural items such as sports and workplace injuries and risks associated with mobile phones. The discipline is increasingly termed 'health impact assessment' (HIA), with an international conference on HIA in its eighth year in 2007.

Illicit and licit drugs, in particular alcohol and tobacco, are no exception to this euro- and dollar-counting trend. Increasingly, public health economists are joining forces with epidemiologists and treatment professionals to estimate or quantify the impact of drug use — social, economic or, more specifically, in terms of healthcare service and resource allocation. Specifically for cannabis, however, methodologies to gauge the global public health impact of cannabis use are yet to emerge, although studies have examined areas such as the treatment of cannabis use disorders, prevention costs, secondary health risks such as driving under the influence of cannabis (see Mann et al., this monograph) and indirect costs (truancy, workplace absenteeism or sick leave, etc.).

As this chapter demonstrates, measuring the global impact of cannabis use represents serious methodological challenges, even when compared with other areas of drug policy. There are confounding issues that arise from consumption of cannabis together with alcohol and tobacco. And whereas other illicit drugs with better understood health risks offer more clear-cut features to measure — in terms of toxicology and effects on physical health — cannabis health effects are more amorphous and offer fewer



## The public health significance of cannabis in the spectrum of psychoactive substances

opportunities for benchmarking harms (see Witton, this monograph). For example, studies of the impact of needle exchange, or prison-based harm reduction projects are able to record changes in drug-related deaths, HIV or hepatitis transmission. Similarly, studies of the impact of smoking bans might measure air quality in bars and clubs, or look at improvements across the general population with regards to smoking-related problems (respiratory problems, heart disease and lung cancer). While some measures can be made of the prevalence of treatment demand, population-level screening for problems related to cannabis use is underdeveloped. Furthermore, cannabis treatment takes many shapes and forms (an overview is provided by Rödner Sznitman, this monograph), making estimations of 'average cost of treatment' difficult.

Any further precision into the public health costs specifically for cannabis in Europe is likely to draw strongly on the expertise of the EMCDDA's Reitox national focal points, and on their scrutiny of treatment demand and treatment costs in particular. Yet this task is far from easy. Estimates were recently made for the EMCDDA on 'health and social care expenditure' for all illicit drugs in Europe (Reitox national reports, 2007; EMCDDA Annual Report, 2007). The exercise showed high variability in reporting: a figure for total drug-related public expenditure in the EU on illicit drugs ranged from EUR 13 billion to EUR 36 billion. Tangible expenditure on illicit drugs — treatment, prevention, enforcement, epidemiology — is subject to a wide range of labels, and is typically distributed across a range of actors: ministerial budgets, NGOs, private and public health insurance, police, customs, etc. In Europe, these actors differ not just within each country in Europe, but also on a federal or provincial level. There are further issues of country size, currency conversion, differing levels of cannabis prevalence, varying patterns of co-consumption (alcohol, tobacco, other illicit drugs) and divergence in the relative cost of healthcare provision and policing across the EU. So, estimating the full impact of cannabis on health with an accountant's accuracy is a distant prospect, even at the level of single Member States.

Nonetheless, the UNODC has begun exploration into the area, and has proposed using treatment demand rates as one of the means to 'weigh' the dangers of illicit drugs. It estimated in 2005 that 78 per 1 000 users of opiates undergo treatment, higher than for cocaine (66 per 1 000 users), amphetamines (16) or cannabis (7) (UNODC, 2005). Work by the European Brain Council, while looking at wider mental health problems, has also improved understanding of the global public health 'footprint' of brain disorders.





## Further reading

Andlin-Sobocki, P., Jönsson, B., Wittchen, H-U., Olesen, J. (2005), *Cost of brain disorders in the EU*, European Brain Council, Brussels.

Kalant, H., Corrigall, W., Hall, W., Smart, R. (eds) (1999), *The health effects of cannabis*, Centre for Addiction and Mental Health, Toronto.

Website of the WHO's European Observatory on Health Systems and Policies  
[www.euro.who.int/observatory](http://www.euro.who.int/observatory)

See also the grey literature list in the Appendix to Volume 1 of this monograph.



---

# The public health significance of cannabis in the spectrum of psychoactive substances

**Robin Room**

## The public health significance of psychoactive substances: the risk of harm

Cannabis is one among a whole spectrum of psychoactive substances used by humans. They are used not only for their psychoactive properties, but also in various other practical functions, depending on the substance — for example, as a medicine, a food, a thirst-quencher, a solvent. Apart from their physical effects, strong values (both positive and negative) are attached to psychoactive substances — in different circumstances, they may serve as a sacrament, as a taboo object, as a symbol of fellowship, as a symbol of stigmatisation (Room, 2005a).

Along with the positive effects and symbolic values of psychoactive substances, to a greater or lesser extent the substances also carry the risk of harm, particularly to the user but also sometimes to those around the user. The public health significance of psychoactive substances lies in these potential and actual harms. Establishing the harms is a prerequisite for deciding on effective public health responses.

It is a commonplace in the literature that the harms associated with psychoactive substances are multidimensional, and that they are greatly affected by the mode and context of use. A recent British publication on *Dangerousness of Drugs*, for instance, rates different psychoactive substances in terms of nine different domains of harm, and also in terms of seven domains of factors (such as route of administration or context of use) that can increase or reduce the dangers. Best et al. (2003) make 'no attempt ... to rank order the target substances, even within each of the domains specified. This is because the dangers are not uni-dimensional nor do they generally occur in isolation'. They continue: 'Drugs are not, of themselves, dangerous, with the risk residing in the interaction between the substance, the individual, the method of consumption and the context of use' (Best et al., 2003).

The dangers are indeed multidimensional and greatly affected by mode and context of use. But still, in a public health policy context it is worthwhile to consider the risk of different psychoactive substances in an overall frame. The present international drug control regime, and national drug control regimes operating in accordance



with it, generally classify drugs into a set of classes according to 'the harm they may cause' (Advisory Council on the Misuse of Drugs, 2002). Any effort to arrive at an improved classification or ranking must start from the rankings implied by the existing classifications.

However, there is presently no clear agreement on how to arrive at an improved and scientifically defensible ranking of dangerousness or of the degree of social and public health problems from different substances (in various use-forms).

## Comparing present levels of social and health harm

One relevant policy consideration, obviously, is the present level of harm in a given society, or on a global basis. Comparisons are most available here between tobacco (considering primarily cigarettes), alcohol and all illicit drugs taken together. For instance, according to the World Health Organisation's estimates for the Global Burden of Disease in 2000, tobacco accounts for 4.1% of the total burden in disability-adjusted life-years globally, alcohol for 4.0%, and illicit drugs for 0.8%. For developed societies such as the United Kingdom, the corresponding figures are 12.2%, 9.2% and 1.8% (Ezzati et al., 2002). Another mode of comparative estimation of harm is in terms of the economic costs to a society from use of different psychoactive substances. While the assumption behind such estimations are subject to substantial criticism (e.g. NIAAA, 1994: 253–259), they do have the advantage of including some of the social as well as the health costs. A representative set of estimates in this mode is for Canada for 1992: CAD 9.6 billion for tobacco, CAD 7.5 billion for alcohol, and CAD 1.4 billion for illicit drugs (Single et al., 1998). In general, the costs for illicit drugs are dominated by the criminal justice costs, primarily of policing the illicit market and punishment for illicit dealing or use.

In a new cost-of-illness analysis for Canada, cannabis, despite being by far the most commonly used illegal drug, accounted for a relatively small part of the estimated health burden from illicit drugs: 6.4% of the overall healthcare costs due to illegal drugs and 2.3% of the years of life lost due to mortality from illegal drugs (calculated from analyses prepared for Rehm et al., forthcoming).

## Comparing the potential for harm

The most obvious objection to basing policy decisions on such estimates is that the present levels of social and health harm are not necessarily the same as what the levels of harm would be if policies changed. The question this leaves, however, is: what is, then, the appropriate basis for judging between psychoactive substances in terms of their adverse effects? Presumably, the answer to this question should be in terms of



realistic scenarios of the substance's potential for harm — its dangerousness — in cases of heavy use. In a research team of which I was a member (Hall et al., 1999), we took the approach to this of comparing the importance (probability and severity) of effects resulting from heavy use of the different substances in their most harmful commonly used form – in the case of cannabis, use by smoking. A more nuanced approach, from a public health perspective, would pay attention to likely rates of such heavy use in a whole population with ready and cheap availability. Rates of dependence or heavy use among users in current circumstances may give some indication in this direction, but for illicit substances they obviously fall short of the full test with ready and cheap availability. At this stage in Europe, cannabis is an in-between case; it could be argued that in the Netherlands cannabis use might not rise much from present levels with full legalisation (cf. MacCoun and Reuter, 2001).

### Comparison on dimensions of danger: overdose

One important dimension of dangerousness or harm is the likelihood of an overdose from the substance. This dimension is obviously of special significance not only for overdoses among recreational and heavy users, but also in more general terms of poison control — for example, labelling and child-proofing containers of the substance. The first column of figures in Table 1 shows partial results of a recent review of the literature by Gable (2004). The 'safety ratio' shown is the ratio between 'the usual effective dose for nonmedical purposes' and the usual lethal dose, for the mode of administration specified. Gable comments, concerning the wider range of drugs considered in his review, that 'the range of safety ratios is so wide that the data appear to have the attributes of an ordinal scale'. In such a scale, cannabis would be in the lowest-risk group, those substances with a ratio of 100 or above.

### Comparison on dimensions of danger: degree of intoxication

Another dimension of dangerousness is the level of intoxication produced by the substance, which 'increases the personal and social damage a substance may do' (Hilts, 1994). Obviously, the level of intoxication produced by taking a substance is highly influenced by the dose taken, and the set and setting of the consumption. A glass of alcohol with dinner will not result in intoxication, while on the other hand, traditional ways of using tobacco among some indigenous South Americans routinely resulted in intoxication to the point that the smoker passed out (Robicsek, 1978). But despite these caveats, there are inherent differences in the propensity of different psychoactive substances to intoxicate. The second column of Table 1 shows rankings made by Jack Henningfield and Neal Benowitz on this (Hilts, 1994). Cannabis was ranked as more intoxicating than tobacco, but less so than alcohol, cocaine and heroin.



Table 1: Ratings on dimensions of danger

	Safety ratio (Gable, 2004)	Intoxicating effect (Hilts, 1994)	Dependence (how hard to quit) (Hilts, 1994)	Potential addictiveness (Strategy Unit, 2005)	Degree of psychic dependence (Roques, 1999)
Cannabis	> 1 000 smoked	Fourth highest	Lowest	**	Weak
MDMA	16 oral	NR	NR	**	(?)
Stimulants	10 oral	NR	NR	***	Middling
Tobacco	NR	Fifth highest	Highest	***	Very strong
Alcohol	10 oral	Highest	Fourth highest	***	Very strong
Cocaine	15 i.n.	Third highest	Third highest	***	Strong but intermittent
Heroin	6 i.v.	Second highest	Second highest	*****	Very strong

Notes

NR, not rated; i.n., intranasal; i.v., intravenous.

Safety ratio = (usual effective dose for non-medical purposes)/(usual lethal dose).

### Comparison on dimensions of danger: dependence

The dependence potential or addictiveness of a substance plays rather little part in the formal criteria for scheduling of substances under the international conventions (Room, 2005b). Nevertheless, there is no doubt that the popular imagery of addiction and addictiveness plays a part in setting the policy stage; in countries like the USA, arguments about the addictiveness of nicotine, for instance, have been secondary only to arguments about second-hand smoking in moving the political process of tobacco control forward. Accordingly, ratings are also available of the dependence potential or addictiveness of different substances. For instance, Henningfield and Benowitz (Hilts, 1994) give comparative ratings of the different substances on withdrawal, tolerance, reinforcement and dependence ('how difficult it is for the user to quit, the relapse rate', etc.). The recent report of the UK Prime Minister's Strategy Unit (2005) offers a rating on 'potential addictiveness', and a French committee chaired by Bernard Roques (1999) offers a rating on 'psychic dependence' (see last three columns of Table 1). The UNODC proposed a 'harm/risk factor' for drugs for use in creating an *Illicit Drugs Index* (UNODC, 2005), using treatment demand data as a measure of harmfulness. Though there is some disagreement in the rankings for other drugs, each of these rankings places cannabis at the lowest level for the substances in the table (the Strategy Unit shows a lower ranking for LSD).

### Comparisons on dimensions of danger: more global ratings

The Roques committee also took a more global approach to the issues of dangerousness. Table 2 shows the Roques committee's rankings on 'Toxicité générale' (general toxicity) and 'Dangerosité sociale' (social dangerousness). In the usage of the Roques report, 'toxicity' includes long-term health effects such as cancer and liver disease, and infections and other consequences of mode of use, as well as the acute effects represented by the safety ratio. The concept of 'social dangerousness' focuses on

Table 2: Ratings on global dimensions of 'dangerousness' (Roques, 1999)

	General toxicity	Social dangerousness
Cannabis	Very weak	Weak
Benzodiazepines (valium)	Very weak	Weak (except when driving)
MDMA/ecstasy	Possibly very strong	Weak (?)
Stimulants	Strong	Weak (possible exceptions)
Tobacco	Very strong	None
Alcohol	Strong	Strong
Cocaine	Strong	Very strong
Heroin	Strong (except therapeutic use of opiates)	Very strong

'states of comportment which can generate very aggressive and uncontrolled conduct ... induced by the product or varied disorders (fights, robberies, crimes ...) in order to obtain it and risks for the user or others, for example in the case of driving a vehicle' (Roques, 1999: 296; original in French). It will be seen that the Roques ratings on 'general toxicity' are compatible with the safety ratios reported by Gable (2004), and that the 'social dangerousness' ratings are compatible with the ratings by Henningfield and Benowitz on intoxicating effect (Hilts, 1994). Cannabis is ranked 'weak' on 'general toxicity', and 'very weak' on 'social dangerousness'.

Hall et al. (1999) took another approach to a global rating of adverse effects of psychoactive substances, comparing four classes of substances in terms of whether there was 'important effect' or a 'less common or less well-established effect' on each of 11 dimensions (Table 3). According to these rankings, alcohol clearly has the greatest potential for harm; among the four substances, cannabis has the lowest number of asterisks.

Nutt et al. (2007) used another global method, identifying three main factors that together determine the harm associated with different drugs: (i) the physical harm to the individual user caused by the drug; (ii) the tendency of the drug to induce dependence; and (iii) the effect of drug use on families, communities and society. Within these categories, they recognised three components to create a nine-category 'matrix of harm'. Physical harms were split into 'acute', 'chronic' and 'intravenous' harm. Dependence was split into 'intensity of pleasure', 'psychological dependence'

Table 3: A summary of adverse effects on health for heavy users of the most harmful common form of each of four drugs (according to Hall et al., 1999)

	Cannabis	Tobacco	Heroin	Alcohol
Traffic and other accidents	*		*	**
Violence and suicide				**
Overdose death			**	*
HIV and liver infections			**	*
Liver cirrhosis				**
Heart disease		**		*
Respiratory diseases	*	**		
Cancers	*	**		*
Mental illness	*			**
Dependence/addiction	**	**	**	**
Lasting effects on the fetus	*	*	*	**

\*\*Important effect, \*less common or less well-established effect.



## The public health significance of cannabis in the spectrum of psychoactive substances

and 'physical dependence'. Social harms were split into 'intoxication', 'other social harms' and 'healthcare costs'. Expert panels gave scores, from 0 to 3, for each category of harm for 20 different drugs. Cannabis was rated at 11th most harmful out of 20 substances: heroin and cocaine were rated the most harmful, while both alcohol and tobacco were rated more harmful than cannabis, with khat, alkyl nitrates and ecstasy rated as least harmful.

Accounts have appeared in Swedish newspapers of a recent ranking of drugs according to their dangerousness, circulated by the Swedish authority for prosecutions (*Åklagarmyndigheten*) to all Swedish prosecutors. Heroin was listed as the most dangerous drug, with others in descending order: ecstasy, amphetamines, cannabis, khat (TT, 2005).

In summary, on every comparison of dangerousness we have considered, cannabis is at or near the bottom in comparison with other psychoactive substances.

## The implications of the comparative findings

The ratings above, and the literature considered elsewhere in this volume, do not by any means exonerate cannabis as a public health concern. In recent years, as noted elsewhere in this volume, there has been some strengthening of the evidence that cannabis may play a part in precipitating or worsening psychosis. The evidence on the adverse effects of driving under the influence of cannabis has also somewhat strengthened (see Mann et al. in this volume). In my view, the asterisks in Table 3 already accommodate these findings, in terms of relative ratings and public health significance. But, whichever way one looks at it, the findings emphasise that, as with most psychoactive substances, use of cannabis can be harmful for some users and in some circumstances.

Comparing degrees of dangerousness is a fraught topic. General comparisons of this type have often faced substantial opposition in the course of publication. The material from the Prime Minister's Strategy Unit was only released on 1 July 2005, 2 years after compilation, in partial compliance with a Freedom of Information request (Travis, 2005). The report by Hall et al. (1999) was eventually published after a media storm (Anonymous, 1998) over its omission from the report for which it was originally commissioned (WHO, 1997). The Roques report also caused considerable controversy when it appeared. As a French review noted, there were complaints not only about including alcohol among 'drugs', but also that the group of experts 'banalized the danger of cannabis by putting in evidence the weak physical and psychic dependence from this product, compared with those of tobacco and alcohol' (Jauffret-Roustide, 2004: 17–18; original in French).





The news reports of the Swedish prosecutors' ranking noted that 'few Swedish politicians admit that certain kinds of drugs are less dangerous than others'. One quoted expert noted the ranking was just 'from a legal perspective', and another that 'one must differentiate between public debate and jurisprudence'. In this perspective, distinctions on dangerousness should remain hidden knowledge: 'if one talks about drugs to youth one has to keep to what is important for them' (TT, 2005). To the question of which are the most dangerous drugs, the Swedish police website answers: 'According to the National Police Board's decision, there is no reason to discuss the dangerousness of different drugs. Preparations classed as narcotics are forbidden or require prescription; hence they are dangerous or harmful to misuse' (Rikspolisstyrelsen, 2005).

There is an enormous commitment by many involved in the international control system and equivalent national systems to keeping the status quo, with the outer defensive line often set around cannabis. But, in a broad public health perspective on psychoactive substances and their potential for harm, it is clear that, on the one hand, tobacco and alcohol are greatly underregulated in current international drug control and regulatory systems, while on the other hand, the restrictions on cannabis are too harsh.

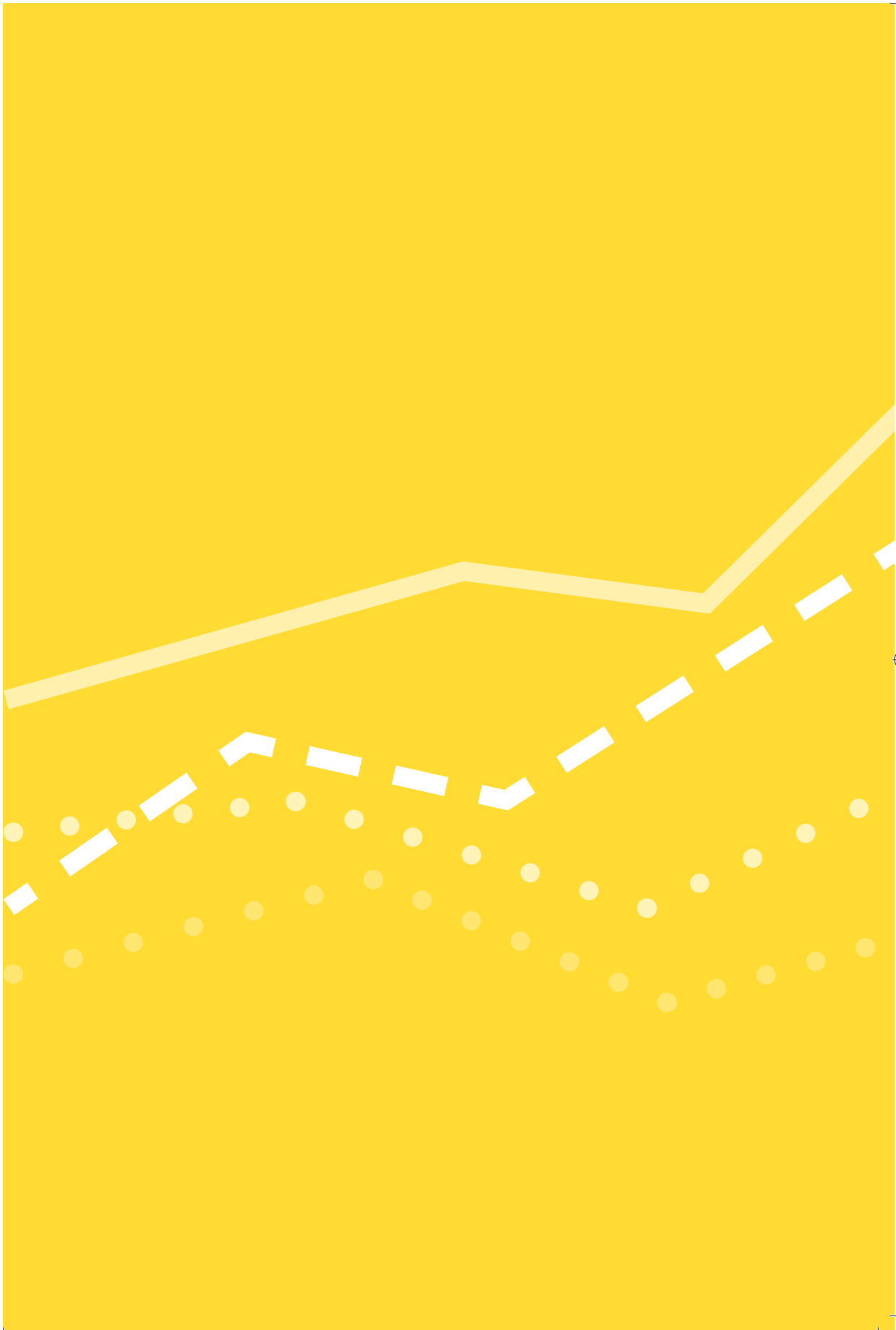
## Acknowledgement

This chapter draws in part on Room (2005b).

## References

- Advisory Council on the Misuse of Drugs (2002), *The classification of cannabis under the Misuse of Drugs Act 1971*. UK Home Office, London  
[www.drugs.gov.uk/publication-search/acmd/Classific\\_Cannabis\\_MisuseDrugsAc?view=Binary](http://www.drugs.gov.uk/publication-search/acmd/Classific_Cannabis_MisuseDrugsAc?view=Binary)
- Anonymous (1998), 'High anxieties: what the WHO doesn't want you to know about cannabis', *New Scientist*, 21 February.
- Best, D., Gross, S., Vingoe, L., Witton, J., Strang, J. (2003), *Dangerousness of drugs: a guide to the risks and harms associated with substance use*. UK Department of Health, London  
[www.dh.gov.uk/assetRoot/04/08/62/93/04086293.pdf](http://www.dh.gov.uk/assetRoot/04/08/62/93/04086293.pdf)
- Ezzati, M., Lopez, A. D., Rodgers, A., Vander Horn, S., Murray, C. J. L., The Comparative Risk Assessment Collaborating Group (2002), 'Selected major risk factors and global and regional burden of disease', *Lancet* 360: 1347–1360.
- Gable, R. S. (2004), 'Comparison of acute lethal toxicity of commonly abused psychoactive substances', *Addiction* 99: 686–696.
- Hall, W., Room, R., Bondy, S. (1999), 'Comparing the health and psychological effects of alcohol, cannabis, nicotine and opiate use', in Kalant, H., Corrigall, W., Hall, W., Smart, R. (eds), *The health effects of cannabis*, Centre for Addiction and Mental Health, Toronto, 475–506.
- Hilts, P. H. (1994), 'Is nicotine addictive? It depends on whose criteria you use: experts say the definition of addiction is evolving', *New York Times*, 2 August, C3  
[www.pdxnorml.org/NYT\\_addictive\\_080294.html](http://www.pdxnorml.org/NYT_addictive_080294.html)

- Jauffret-Roustide, M. (ed.) (2004), *Les drogues: approche sociologique, économique et politique* [Drugs: a sociological, economic and political approach], La Documentation française, Paris.
- MacCoun, R., Reuter, P. (2001), *Drug war heresies: learning from other vices, times and places*, Cambridge University Press, Cambridge.
- NIAAA (1994) *Eighth special report to the U.S. Congress on alcohol and health*, NIH Publication No. 94-3699, National Institute on Alcohol Abuse and Alcoholism, Bethesda, MD.
- Nutt, D., King, L., Saulsbury, W., Blakemore, C. (2007), 'Development of a rational scale to assess the harm of drugs of potential misuse', *The Lancet*: 369(9566): 1047–1053.
- Rehm, J., Baliunas, D., Brochu, S., Fischer, B., Gnam, W., Patra, J., Popova, S., Sarnocinska-Hart, A., Taylor, B. (forthcoming), *The costs of substance abuse in Canada 2002*, Canadian Centre on Substance Abuse, Ottawa.
- Rikspolisstyrelsen (2005), *Narkotika* (drugs). Rikspolisstyrelsen [National Police Board], Stockholm [www.polisen.se/inter/nodeid=16602&pageversion=1.html](http://www.polisen.se/inter/nodeid=16602&pageversion=1.html)
- Robicsek, F. (1978), *The smoking gods: tobacco in Maya art, history, and religion*, University of Oklahoma Press, Norman.
- Room, R. (2005a), 'Symbolism and rationality in the politics of psychoactive substances', in Lindgren, B., Grossman, M. (eds), *Substance use: individual behaviour, social interactions, markets and politics*, 331–346.
- Room, R. (2005b), *Social policy and psychoactive substances: a review. Report to the Foresight Brain Science, Addiction and Drugs Project*, Foresight Directorate, Office of Science and Technology, London [www.foresight.gov.uk/docs/19471-Social%20Policy.pdf](http://www.foresight.gov.uk/docs/19471-Social%20Policy.pdf)
- Roques, B., chair (1999), *La dangerosité de drogues: rapport au secrétariat d'État à la santé* [The dangerousness of drugs: report to the state secretariat for health], La Documentation française-Odile Jacob, Paris.
- Single, E., Robson, L., Xie, X., Rehm, J. (1998), 'Economic costs of alcohol, tobacco and illicit drugs in Canada, 1992', *Addiction* 93: 991–1066.
- Strategy Unit (2005), *Strategy unit drugs report, May 2003*. Prime Minister's Strategy Unit, London [www.strategy.gov.uk/work\\_areas/drugs/index.asp](http://www.strategy.gov.uk/work_areas/drugs/index.asp). The full report is at <http://image.guardian.co.uk/sys-files/Guardian/documents/2005/07/05/Report.pdf>
- Tidningarnas Telegrambyrå (TT) (2005), 'Narkotika rangordnat efter farlighet (drugs rank-ordered by dangerousness)', *Svenska Dagbladet*, 16 December.
- Travis, A. (2005), 'Revealed: how drugs war failed', *The Guardian*, 5 July [www.guardian.co.uk/uk\\_news/story/0,,1521479,00.html](http://www.guardian.co.uk/uk_news/story/0,,1521479,00.html)
- UNODC (2005), 'Towards the creation of an Illicit Drug Index', Chapter 4 in *World drug report 2005*, United Nations Office on Drugs and Crime, Vienna, 165–174.
- WHO (1997), *Cannabis: a health perspective and research agenda*. World Health Organisation, Division of Mental Health and Prevention of Substance Abuse, Geneva, WHO/MSA/PSA/97.4 [http://whqlibdoc.who.int/hq/1997/WHO\\_MSA\\_PSA\\_97.4.pdf](http://whqlibdoc.who.int/hq/1997/WHO_MSA_PSA_97.4.pdf)







## Chapter 8

# Assessing the population health impact of cannabis use

**Keywords:** cannabis – drug policy – economics – health – mental health – public health

### Setting the context

There is a tendency in discussions of responses to cannabis use to rely on faulty logic. From the perspective of drugs professionals, these might manifest themselves in terms of a mild prejudice: ‘study finds that mass media prevention campaign had boomerang effect’ becomes ‘mass media preventions do not work’. Or perhaps ‘higher prevalence of schizophrenia among cannabis users’ becomes ‘there is a causal link between schizophrenia and cannabis use’.

In a stronger form, the media may encourage the inference of unrelated behaviours in relation to cannabis. Issues of cannabis potency, mental health and crime often share headlines. We may cite examples noted in the EMCDDA’s press corpus during production of this monograph: ‘Deranged cannabis smoker obsessed with Satanism stabbed country vicar to death’<sup>(1)</sup>; ‘Son twisted by “skunk” knifed father 23 times’<sup>(2)</sup>. Public and political debate on cannabis users can sometimes be drowned out by the noise generated by such salacious headlines.

This chapter — written by Wayne Hall, one of the world’s most published experts on cannabis use — advocates a sceptical eye with regard to claims made for the public health impact of cannabis. Developing the theme of public health impact studies discussed by Robin Room in the previous chapter, this chapter looks at the difficulties involved in assessing the global effect of cannabis use on the health of entire populations.

<sup>(1)</sup> *London Evening Standard*, 17 October 2007.

<sup>(2)</sup> *Daily Mail*, 23 July 2007.



## Assessing the population health impact of cannabis use

On a practical level, the chapter provides a checklist to help researchers to question any assumptions or to avoid causal inferences<sup>(3)</sup>. From an epidemiological point of view, the data on the precise impacts of chronic cannabis use are weak, especially compared with what we know about alcohol and tobacco. Furthermore, assessing the impact of cannabis problems is difficult and beset with ethical problems, not least because of the illicit status of the drug and a tendency for it to be discussed in conjunction with, or compared with, other illicit drugs that carry higher toxicological risks.

The chapter also mentions an 'inflationary–deflationary dialectic', in which cannabis problems have been both demonised by moralists and belittled by pro-cannabis organisations. Decoupling cannabis from political discussions is necessary in order to quantify the harms of cannabis, and to place them against a neutral background where they are compared with other health issues. The chapter also suggests that the temptation to focus on adverse health effects needs to be balanced with potential positive effects of cannabis use. This argument is often applied to defend moderate alcohol use vis-à-vis the harms of binge drinking or alcoholism. While efforts to quantify the public health harms of illicit drug use are currently only in an embryonic stage, research into any 'balancing' public health benefits is extremely rare.

## Further reading

- Hall, W., Pacula, R. (2003), *Cannabis use and dependence: public health and public policy*, Cambridge University Press, Cambridge.
- MacCoun, R., Reuter, P. (2001), *Drug war heresies: learning from other vices, times and places*, Cambridge University Press, Cambridge.
- Mackay, C. (1852), *Memoirs of extraordinary popular delusions and the madness of crowds*, Office of the National Illustrated Library, London.

See also the grey literature list in the Appendix to Volume 1 of this monograph.

<sup>(3)</sup> See also the comments on meta-reviews by Bergmark, this monograph.



# Assessing the population health impact of cannabis use

Wayne Hall

There are major technical challenges in assessing the impact that cannabis use has on the health of users and public health (Hall, 1999). These include difficulties in deciding whether cannabis use is a contributory cause of the adverse health and psychological effects attributed to its use and in quantifying the magnitude of these adverse health effects. These technical challenges are amplified by the difficulties in separating the political debate about the legal status of cannabis use from appraisals of its health effects.

## Making causal inferences

Before a claim can be accepted that cannabis causes an adverse health outcome there must be evidence that there is an association between cannabis use and the health outcome; the association is not due to chance; cannabis use preceded this outcome; and we can make a case for the implausibility of alternative, non-causal explanations of the association (Tukey and Brillinger, 1984; Hall, 1987; Strom, 2000).

- Evidence of association: reasonable evidence of an association between cannabis use and a health outcome (e.g. schizophrenia) is provided by finding a relationship between cannabis use and the outcome in case-control, cross-sectional, cohort or experimental studies.
- Excluding chance: evidence that chance is an unlikely explanation of the relationship is provided by constructing a confidence interval around the sample value of a measure of association. We infer that an association exists if the confidence interval does not include the null value (i.e. the value consistent with no relationship). The width of the confidence interval provides an indication of the degree of uncertainty surrounding the inference, while its upper limit indicates how large an association may have gone undetected (Altman and Gardner, 2000).
- Ascertaining temporal order: if cannabis use is the cause of an effect, then there should be good evidence that cannabis use precedes it. The strongest evidence that cannabis use precedes certain health effects is provided by either a cohort study or an experiment. In the former the researcher observes that cannabis use precedes the health effect while in the latter the experimenter ensures by design that it does so.



## Assessing the population health impact of cannabis use

- Deciding between alternative explanations: the hardest criterion to satisfy is that of excluding the possibility that the relationship between cannabis use and the health outcome is due to an unmeasured variable that causes both cannabis use and the adverse health outcome. In surveys of high-school-aged adolescents, for example, cannabis users typically perform more poorly at school than non-cannabis users (Hawkins et al., 1992). This may be because cannabis use is a cause of poor school performance but an equally plausible hypothesis is that learning difficulties cause both poor school performance and cannabis use (Lynskey and Hall, 2000).

Experimental evidence provides the 'gold standard' for ruling out these common causal explanations (Fisher, 1947; Cook and Campbell, 1979; Shadish et al., 2002). Randomly assigning adolescents to use cannabis or not, for example, would ensure that cannabis users and non-users were equivalent before using cannabis. Hence, any subsequent differences in educational performance could be attributed to cannabis use rather than to pre-existing differences in ability. When studying anything except acute and innocuous health effects, random assignment of individuals to use cannabis or not is impossible for ethical and practical reasons. It would be unethical, for example, to force some adolescents to use cannabis, and impracticable, even if ethical, to prevent those assigned not to use the drug from doing so.

Experimentation using laboratory animals is one way of getting around the impossibility of human experimentation. But suitable experimental animal models are not available for many of the putative adverse psychosocial effects of cannabis use such as psychosis, school performance and personal adjustment. In addition, there are problems in extrapolating results across species, different routes of administration (e.g. oral and parenteral in animals versus smoked in humans), and the very high doses that are typically used in animal studies.

When a suitable animal model does not exist, and randomisation of human subjects is impractical or unethical, statistical methods must be used to adjust for the effects of pre-existing differences in risk between cannabis users and non-users. If the relationship persists after statistical adjustment, the confidence is increased that the relationship is not attributable to the variables for which statistical adjustment has been made (MacLeod et al., 2004). This type of control has been used, for example, in longitudinal studies of adolescent cannabis use and psychosis (e.g. Caspi et al., 2005; Fergusson et al., 2005; Henquet et al., 2005).

## Acute health effects

The acute health effects of any drug are easier to appraise than the chronic effects: the temporal order is clear; drug use and the effects occur closely together in time; and







if the effects are not dangerous, they can be reliably reproduced by giving the drug under controlled conditions. All this is true of the most common psychoactive effects of cannabis (e.g. euphoria, relaxation, sociability) and some of the more commonly reported adverse acute effects such as anxiety, panic and depression (Hall and Pacula, 2003).

It is more difficult to decide upon the causal contribution that cannabis use makes to relatively rare, acute adverse experiences such as flashbacks and psychotic symptoms. It is difficult to decide whether these are rare events that are coincidental with cannabis use, the effects of other drugs which are often taken together with cannabis, rare consequences of cannabis use that only occur at doses that are much higher than those used recreationally, cannabis effects that require unusual forms of personal vulnerability or the results of interactions between cannabis and other drugs.

## Chronic health effects

Causal inferences about the long-term effects of chronic cannabis use become more difficult the longer the interval between use and the adverse effects. It takes time for adverse effects to develop and usually it takes even longer for a connection to be suspected between the two. This is largely because the longer the time interval between cannabis use and the health consequence, the more numerous the alternative explanations of the association that need to be excluded.

We often have to trade off rigour and relevance in evidence on the effects of chronic cannabis use. The most rigorous evidence is provided by laboratory investigations using experimental animals, but its relevance to human use is often uncertain. Epidemiological studies are manifestly more relevant in assessing human health effects, but they are usually less rigorous in assessing exposure to cannabis and in excluding alternative explanations of the associations. The consequence is increased uncertainty about the interpretation of epidemiological studies that affects interpretations of the causal significance of associations ('positive' studies) as well as studies that fail to find such relationships ('negative' studies).

A common interpretative problem with positive findings is that cannabis use is correlated with alcohol, tobacco and other illicit drug use that also adversely affect health. Generally, the heavier the cannabis use, the more likely that the person also uses these other psychoactive drugs (Newcomb and Bentler, 1989; Kandel and Yamaguchi, 1993). This can produce spurious associations between cannabis use and health outcomes, which makes it difficult to confidently attribute any adverse health effects to cannabis. This has been the case, for example, in interpreting the evidence on the role of cannabis use in motor vehicle accidents (Hall and Pacula, 2003; Mann et al., this monograph).



When studies fail to find adverse health effects of chronic cannabis use, for example immunological effects, it may be unclear whether this means that THC has few, if any, immunological effects in humans, or that our research has not had the sensitivity to detect its effects. The answer to this question depends upon the likely magnitude of any adverse effects, their relationship to dose, frequency and duration of use, and the ability of studies with small sample sizes to detect them (Hall and Einfeld, 1990).

## An overall appraisal of causal hypotheses

Causal inferences are often made in the light of a research literature by judging the extent to which standard criteria such as those outlined by Hill (1977) are met. These criteria are not sufficient for establishing that an association is a token of a causal relationship since it is possible for the criteria to be met and yet to be mistaken in making a causal inference. In general, however, the more of the criteria that are met, the more likely it is that the association is a token of a causal relationship.

**Strength of association:** relationships that are stronger indicate that if cannabis is used there is a high likelihood that the health effect will also occur. Stronger relationships are generally more deserving of trust than weaker ones because the latter are more easily explained by measurement or sampling biases.

**Consistency of relationship:** relationships which are consistently observed by different investigators, studying different populations, using varied measures and research designs, are generally more credible than relationships which are not. This is because a relationship that persists despite differences in sampling and research methods is less likely to be explained by sampling, measurement or other biases.

**Specificity** is a desirable but not a necessary condition. It exists when cannabis use is strongly associated with the outcome, and the health outcome is rare in the absence of cannabis use. Specificity is desirable in that if it exists we can be more confident that there is a relatively simple and direct causal relationship but its absence does not exclude the possibility of a more complex causal relationship (e.g. in which the effect is conditional on the presence of other factors).

**Biological gradient** refers to the existence of a dose–response relationship between cannabis use and the health outcome: the more heavily cannabis has been used, the greater the likelihood of the health outcome. Satisfaction of this criterion is also desirable but not necessary since there may be other patterns of relationship between exposure and disease, for example a threshold effect, an ‘all or none’ effect or a curvilinear relationship.





Biological plausibility refers to the consistency of the relationship with other biological knowledge. If we can think of no conceivable mechanism whereby cannabis can produce such an effect, then we may have grounds for scepticism. But in the face of compelling evidence of association from well-controlled studies, implausibility may be a signal that existing theories are wrong or that we need to develop new theories that explain previously unknown phenomena.

Coherence means that the relationship coheres with, or makes sense of, other information about the natural history and biology of the disease. This, too, is desirable but not necessary: it is desirable that we have independent information that we can trust but its absence is not fatal, since the other information with which it is inconsistent may be in error.

## Assessing the magnitude of risk

The standard epidemiological measures of risk magnitude are relative risk and population attributable risk. The relative risk is the increase in the odds of experiencing an adverse health outcome among those who use cannabis compared with those who do not. It may be quantified as a relationship between the frequency and duration of cannabis use and the risk of experiencing an adverse health outcome. The population attributable risk represents that proportion of cases with an adverse outcome that can be attributed to cannabis use, if it is causal.

The two measures of risk have different uses and implications. Relative risk is most relevant to individuals attempting to estimate the increase in their risk of experiencing an adverse outcome if they use a drug. Attributable risk is of most relevance to a societal appraisal of the harms of drug use. The importance of the two measures of risk magnitude depends upon the prevalence of drug use and the base rate of the adverse outcome. An exposure with a low relative risk may have a low personal significance but a large public health impact if a large proportion of the population is exposed (e.g. cigarette smoking and heart disease). Conversely, an exposure with a high relative risk may have little public health importance because very few people are exposed to it, but it may have major significance for those individuals who are exposed.

Another way of assessing the health risk posed by cannabis use is to compare its health risks with those of other widely used recreational drugs such as alcohol, tobacco, cocaine and heroin (Hall et al., 1999). Such comparisons minimise double standards in the appraisal of the health effects of cannabis use by using a common standard for comparison. The comparison, however, is more difficult than it seems at first, even in the case of the more widely used and best-studied drugs, alcohol and tobacco. Comparison is even more difficult in the case of less commonly used illicit drugs like cocaine, heroin, ecstasy and amphetamine.



## Assessing the population health impact of cannabis use

First, we know much more about the risks of acute and chronic tobacco and alcohol use than we do about the risks of cannabis use. The legal drugs have been consumed by substantial proportions of the population over centuries and there have been more than 50 years of scientific studies of the health consequences of their use (see English et al., 1995). Cannabis, by contrast, has been much less widely used in Western society, for a shorter period, and primarily by healthy young adults who have usually discontinued their use in their mid- to late 20s (Hall and Pacula, 2003).

Second, the prevalence of regular use of cannabis is much lower than that of alcohol and tobacco. In principle, this problem could be addressed by estimating what the health effects of cannabis use would be if its prevalence approached that of alcohol and tobacco. Although conceptually simple, in the absence of good data on the quantitative risks of cannabis use a large number of contestable assumptions have to be made in order to make such estimates.

We cannot simply estimate what the health risks of cannabis use would be if it were as commonly used as alcohol and tobacco by multiplying its estimated risks on current patterns of use by the number of potential users in the population. This calculation assumes that the risks are the same regardless of who uses cannabis, or the legal regime under which it is used. These may be unreasonable assumptions because (i) the variability among the characteristics of cannabis users or the diversity of 'types' of people who use cannabis when its prevalence of use is low might increase under a regime of legal use and (ii) if cannabis use were legal it would be possible to reduce some of the respiratory risks of cannabis smoking by encouraging cannabis users to ingest or vaporise rather than to smoke the drug. It would also be easier if cannabis use was legal to give users advice on how to reduce other risks, for example by not driving a car for several hours after using the drug, and restricting the frequency of use to weekly or less often.

## Are there any benefits of cannabis use?

The benefits of cannabis use are rarely discussed in cannabis policy debates. The exception is its possible use to treat symptoms of chronic illnesses that are unresponsive to current medical treatment (Hall and Pacula, 2003). The key role played by health effects in the policy debate has meant that there has been very little research on the benefits of recreational cannabis use. If, as economists argue, adults are the best judges of their own interests, then the fact that a substantial proportion of adults in developed societies use cannabis for recreational purposes is *prima facie* evidence that some cannabis users benefit from its use (Hall and Pacula, 2003). There is an absence of evidence for more specific benefits of cannabis use, although a number of such effects have been suggested.





One possible benefit is that moderate cannabis use may improve mental health, as recent evidence suggests may be true for moderate use of alcohol (Rodgers et al., 2000). In the case of cannabis, epidemiological studies to date have typically found that the heavier the cannabis use is, the poorer the user's mental health (see Hall and Pacula, 2003, Chapter 13) but more and much better controlled research is needed (MacLeod et al., 2004).

The evidence is also limited and mixed on a second possible benefit of cannabis use, namely, that of substituting for the use of arguably more harmful drugs like alcohol, cocaine and heroin. The epidemiology of alcohol and cannabis use suggest a complementary relationship in that heavy consumers of alcohol are more likely to be heavy cannabis users and vice versa, particularly among young people (see Hall and Pacula, 2003, Chapter 13). The evidence among adults is more mixed, with race, ethnicity and country of origin influencing the findings. The evidence on the relationship between cannabis and other illicit drugs is controversial (Hall and Pacula, 2003). Both questions deserve to be better investigated.

There is better evidence for the therapeutic uses of cannabis. There is reasonable evidence for the therapeutic use of THC as an antiemetic agent in the treatment of nausea and vomiting caused by cancer chemotherapy. More effective antiemetic agents are now available, so it remains to be seen how widely the cannabinoids will be used for this purpose. There is also reasonable evidence for the efficacy of THC in the treatment of AIDS-related wasting. There is evidence that cannabinoids may have analgesic and antispasmodic properties that warrant further research into their effectiveness (Hall and Degenhardt, 2003).

## The social and political context of appraisal

Appraisals of the hazards of most drug use are affected by the societal approval or disapproval of the drug (Room, 1984). Those who approve of using the drug tend to engage in 'problem deflation' by minimising the adverse health and social effects of its use. Those who disapprove tend to engage in 'problem inflation' by uncritically accepting any evidence of harm.

An inflationary–deflationary dialectic has affected appraisals of the health effects of cannabis use. Politically conservative opponents of cannabis use, for example, justify its continued prohibition by citing personal and social harms of its use (e.g. Nahas and Latour, 1992). When the evidence is uncertain, they resolve the uncertainty by assuming that cannabis use is unsafe until proven safe. Complementary behaviour is shown by those proponents of decriminalisation who discount evidence of harm and resolve uncertainties about the ill-effects of cannabis use by demanding evidence that is difficult



## Assessing the population health impact of cannabis use

to provide, arguing that until uncertainty is resolved individuals should be allowed to choose whether or not they use the drug.

Problem deflationists typically discount the adverse effects of their preferred drugs by denying that there is a causal connection between drug use and particular adverse health effects. A popular way of discounting evidence of adverse health effects of drug use is to set such a high standard of proof that we can never 'know' whether it causes the effect. The standard of proof reflects the degree of confidence we require in a causal connection between drug use and harm. In courts of law, the standard of proof demanded depends upon the seriousness of the offence and the consequences of a conviction. The standard is 'beyond reasonable doubt' in criminal cases that may lead to imprisonment if convicted while the 'balance of probabilities' is acceptable in civil cases where the penalties are fines. Sceptics often demand something close to 'beyond reasonable doubt'.

The standard legal method for resolving a dispute in the face of uncertainty is to create a default outcome by placing a burden of proof upon one or the other side in the case. The arguer who bears the burden of proof loses the case if they fail to discharge their burden. The accused in a murder trial, for example, is presumed to be innocent until proven guilty because it is the prosecution's burden to make a case for guilt beyond reasonable doubt; failure to do so means that the defendant has to be acquitted.

In the debate about the legal status of cannabis, the question of who bears the burden of proof is controversial (see Rescher, 1977, Chapter 12). If the burden of proof falls on those who claim that the drug is safe, uncertainty will be resolved by assuming that it is unsafe until proven otherwise; conversely, if the burden falls on those who claim that the drug is unsafe, then it will be assumed to be safe until proven otherwise. Proponents of continued prohibition of cannabis use appeal to established practice (Whately, 1963 [1846]), arguing that since the drug is illegal the burden of proof falls on those who want to legalise it to demonstrate its safety. Proponents of legalisation often argue that there was no evidence that cannabis was harmful when its use was criminalised. Some argue that, in any case, the burden of proof falls upon those who wish to use the criminal law to prevent adults from choosing to use a drug (e.g. Husak, 1992).

## Improving assessments of the health effects of cannabis

The following proposals aim to improve assessments of the health risks of cannabis by ensuring that ignorance is disclosed, making it easier to identify what we need to know in order to reduce it, and making it less likely that empirical issues will be confused with moral ones and vice versa.



### Avoid treating cannabis as a special case

According to some, cannabis is a 'mind-expanding', 'consciousness-raising' drug, which is especially benign in its effects on health. To its opponents, cannabis is a 'deceptively dangerous' drug in which the absence of acute toxic effects disguises its insidious adverse effects on users and society (Nahas and Latour, 1992). We should instead adopt the same approach to evaluating the health effects of cannabis use that are used in appraising the health effects of alcohol, tobacco and other illicit drugs.

### Burden of proof should be responsive to evidence

Any inquiry into the health effects of cannabis should begin with the assumption derived from pharmacology and toxicology that it may harm the health of some users when used at some dose, frequency or duration of use, or some methods of administration (Fehr and Kalant, 1983). Given that cannabis is an intoxicant like alcohol, and a drug that is usually smoked like tobacco, there are additional reasons to expect that cannabis will share at least some of the acute and chronic health effects of these two drugs.

This expectation does not mean that we assume that cannabis use is unsafe until proven safe. Rather, it means that the burden of proof will be responsive to the state of the evidence and it may vary for different health effects. If there is a *prima facie* case for cannabis causing a specific harm, then evidence of safety should be required. A *prima facie* case could comprise either direct evidence that cannabis has ill effects in humans (e.g. from a case-control study), or a compelling argument for such an effect, for example the fact that the constituents of cannabis and tobacco smoke are similar, and that tobacco smoking causes respiratory cancers, makes it likely that heavy cannabis smoking is also a contributory cause of these cancers (Hall and MacPhee, 2002).

### Use a reasonable standard of proof

If we require proof beyond reasonable doubt that there are adverse health effects of cannabis, then very few conclusions will be drawn about its health effects, and very little advice can be given on how to reduce these risks. Reasonable inferences and sensible, if fallible, health advice can be given if evidential criteria are used to draw conclusions about the probable adverse health effects of cannabis in the same way as we do about any other drug. This standard may be taken to be satisfied by the consensus of informed scientific opinion that sufficient evidence has been provided to infer a causal connection between cannabis use and a health outcome. A consensus is indicated by the views expressed in authoritative reviews in peer reviewed journals and consensus conferences of experts (e.g. Institute of Medicine, 1982; Fehr and Kalant, 1983; WHO Programme on Substance Abuse, 1997).

## Apply standards consistently

There will continue to be disagreements about standards of proof, burden of proof and what kinds of evidence count, but whatever evidential standards are used should be applied even-handedly. The best protection against the use of double standards in their application is for those conducting appraisals of the health effects of cannabis to be as explicit as possible about the evidential standards that they have used, and as even-handed as possible in their application.

## Separate the legal and health issues

We would improve our appraisal of the health effects of cannabis if we clearly separated it from the legal issue. The two issues are connected since the adverse health effects of cannabis use are one of the justifications offered for treating cannabis use as a criminal offence. Consequently, if there were no adverse health effects of cannabis use, a different justification would need to be found for its continued prohibition.

Even if there are adverse health effects of cannabis, the connection between the adverse health effects of cannabis and its legal status is not as simple as has been assumed. If adverse health effects were a sufficient warrant for the legal prohibition of cannabis use then logic would demand that alcohol and tobacco use should also be prohibited. Our failure to prohibit alcohol and tobacco use indicates that socially important values other than personal or public health are at stake. These include individual autonomy and personal liberty, and the economic and social costs of trying to prevent a substantial proportion of the adult population from doing something that they want to do. These values must be weighed against public health, and a balance produced as the outcome of a political process that is informed by a fair appraisal of the health risks of cannabis use (Hall and Pacula, 2003).

The failure to separate the health and legal issues means that the appraisers' views about the legal status of cannabis often prejudice their appraisals of its health effects. A clear distinction between the two issues is the best way of ensuring a fair and useful discussion of both.

## Conclusions

Causal inferences about the adverse health effects of cannabis are complicated by a dearth of good studies of relationships between cannabis use and health outcomes; uncertainty in some cases about which came first, the cannabis use or the health effect; difficulties in excluding plausible alternative explanations of associations that have been observed in the absence of experimental studies; and, in the case of null



findings, uncertainty as to whether they provide reasonable evidence of the absence of effects, or only an absence of evidence. An estimation of the magnitude of the health risks of cannabis is handicapped by the absence of epidemiological studies that provide quantitative estimates of the risks in representative samples of users. Attempts to compare the public health significance of cannabis use with that of more widely used drugs like alcohol and tobacco are complicated by the greater comparative ignorance of the adverse health effects of cannabis use, and by the marked difference in their current prevalence of use. More attention needs to be given to evaluating evidence for and against benefits claimed for cannabis use.

A fair appraisal of the health effects of cannabis has been hampered by a deflationary–inflationary dialectic between opponents and proponents of cannabis use. Problem deflation has been assisted by demands for unreasonably high standards of proof, and the disagreement about who bears the burden of proof has prevented a resolution of uncertainty about these health effects.

Our appraisals of the health effects of cannabis would be improved if we: stopped treating cannabis use as a special case; distinguished clearly between health and legal issues; varied the burden of proof depending upon the state of the evidence about adverse health effects; used a reasonable standard of proof; and above all else, applied evidential standards consistently and even-handedly.

## Acknowledgement

I would like to thank Sarah Yeates for her invaluable assistance in locating the literature and preparing this paper for publication.

## References

- Altman, D., Gardner, M. (2000), *Statistics with confidence: confidence intervals and statistical guidelines*, BMJ Books, Bristol.
- Caspi, A., Moffitt, T., Cannon, M., McClay, J., Murray, R., Harrington, H., Taylor, A., Arseneault, L., Williams, B., Braithwaite, A., Poulton, R., Craig, I. W. (2005), 'Moderation of the effect of adolescent-onset cannabis use on adult psychosis by a functional polymorphism in the catechol-O-methyltransferase gene: longitudinal evidence of a gene x environment interaction', *Biological Psychiatry* 57: 1117–1127.
- Cook, T., Campbell, D. (1979), *Quasi-experimentation: design and analysis issues for field settings*, Chicago: Rand McNally.
- English, D., Holman, C., Milne, E., Winter, M., Hulse, G., Codde, S., Corti, B., Dawes, V., De Klerk, N., Knuiman, M., Kurinczuk, J., Lewin, G., Ryan, G. (1995), *The quantification of drug caused morbidity and mortality in Australia, 1995*, Commonwealth Department of Human Services and Health, Canberra.
- Fehr, K., Kalant, H. (1983), *Cannabis and health hazards*, Addiction Research Foundation, Toronto.

- Fergusson, D., Horwood, L., Ridder, E. (2005), 'Tests of causal linkages between cannabis use and psychotic symptoms', *Addiction* 100: 354–366.
- Fisher, R. (1947), *The design of experiments*, Oliver and Boyd, Edinburgh.
- Hall, W. (1987), 'A simplified logic of causal inference', *Australian and New Zealand Journal of Psychiatry* 21: 507–513.
- Hall, W. (1999), 'Assessing the health and psychological effects of cannabis use', in Kalant H., Corrigall, W., Hall, W., Smart, R. (eds), *The health effects of cannabis*, Centre for Addiction and Mental Health, Toronto, 1–17.
- Hall, W., Degenhardt, L. (2003), 'Medical marijuana initiatives: are they justified? How successful are they likely to be?' *CNS Drugs* 17: 689–697.
- Hall, W., Einfeld, S. (1990), 'On doing the "impossible": inferring that a putative causal relationship does not exist', *Australian and New Zealand Journal of Psychiatry* 24: 217–226.
- Hall, W., MacPhee, D. (2002), 'Cannabis use and cancer', *Addiction* 97: 243–247.
- Hall, W., Pacula, R. L. (2003), *Cannabis use and dependence: public health and public policy*, Cambridge University Press, Cambridge.
- Hall, W., Room, R., Bondy, S. (1999), 'Comparing the health and psychological risks of alcohol, cannabis, nicotine and opiate use', in *The health effects of cannabis*, Kalant, H., Corrigall, W., Hall, W., Smart, R. (eds), Centre for Addiction and Mental Health, Toronto, 475–506.
- Hawkins, J., Catalano, R., Miller, J. Y. (1992), 'Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention', *Psychological Bulletin* 112: 64–105.
- Henquet, C., Krabbendam, L., Spauwen, J., Kaplan, C., Lieb, R., Wittchen, H. U., van Os, J. (2005), 'Prospective cohort study of cannabis use, predisposition for psychosis, and psychotic symptoms in young people', *British Medical Journal* 330  
www.bmj.com/cgi/content/abstract/bmj.38267.664086.63v1
- Hill, A. B. (1977), *A short textbook of statistics*, Hodder and Stoughton, London.
- Husak, D. N. (1992), *Drugs and rights*, Cambridge University Press, Cambridge.
- Institute of Medicine (1982), *Marijuana and health*, National Academy Press, Washington DC.
- Kandel, D., Yamaguchi, K. (1993), 'From beer to crack: developmental patterns of drug involvement', *American Journal of Public Health* 83: 851–855.
- Lynskey, M., Hall, W. D. (2000), 'The effects of adolescent cannabis use on educational attainment: a review', *Addiction* 96: 433–443.
- MacLeod, J., Oakes, R., Copello, A., Crome, I., Egger, M., Hickman, M., Oppenkowski, T., Stokes-Lampard, H., Davey-Smith, G. (2004), 'The psychosocial consequences of use of cannabis and other illicit drugs: systematic review of longitudinal, general population studies', *Lancet* 363: 1579–1588.
- Nahas, G., Latour, C. (1992), 'The human toxicity of marijuana', *Medical Journal of Australia* 156: 495–497.
- Newcomb, M. D., Bentler, P. M. (1989), 'Substance use and abuse among children and teenagers', *American Psychologist* 44: 242–248.
- Rescher, N. (1977), *Methodological pragmatism*, Blackwell, Oxford.
- Rodgers, B., Korten, A. E., Jorm, A. F., Jacomb, P. A., Christensen, H., Henderson, A. S. (2000), 'Non-linear relationships in associations of depression and anxiety with alcohol use', *Psychological Medicine* 30: 421–432.
- Room, R. (1984), 'Alcohol and ethnography: a case of problem deflation?' *Current Anthropology* 25: 169–191.
- Shadish, W. R., Cook, T. D., Campbell, D. T. (2002), *Experimental and quasi-experimental designs for generalized causal inference*, Houghton Mifflin, Boston.
- Strom, B. L. (2000), 'Study designs available for pharmacoepidemiology', in Strom, B. L. (ed.), *Pharmacoepidemiology*, John Wiley, Chichester, UK.



- Tukey, J. W., Brillinger, D. R. (1984), *The collected works of John W. Tukey, Volume IV: philosophy and principles of data analysis 1965–1986*, Wadsworth Advanced Books & Software, Belmont, CA.
- Whately, R. (ed.) (1963 [1846]) *Elements of rhetoric*, Carbondale, IL: Southern Illinois University Press.
- WHO Programme on Substance Abuse (1997), *Cannabis: a health perspective and research agenda*, Division of Mental Health and Prevention of Substance Abuse, World Health Organisation, Geneva.





## Chapter 9

# Cannabis use and driving: implications for public health and transport policy

**Keywords:** cannabis – driving – DUI/C – road safety – roadside testing

### Setting the context

While cannabis has been a topic of research interest for many years, it has only been recently that the issue of cannabis and road safety has been the subject of a substantial amount of public and government interest. In Europe, the subject has received considerable attention in recent years. An EMCDDA literature review on the effects of drug use on driving, originally published in 1999, was updated in 2007, while a selected issue on drugs and driving formed part of the 2007 *Annual report*. At the European Member State level, numerous initiatives have been carried out on drugs and driving, including specific interventions to reduce driving under the influence of cannabis. For example, in France a major research and prevention campaign <sup>(1)</sup> was launched in 2006, while a supporting study estimated that cannabis accounted for an additional 230 annual road deaths in France, with a significant proportion of these deaths affecting young people under 25 (French national report, 2005). A survey into drug use in recreational settings in the Czech Republic ( $n = 1\,010$ ) found that 56% of respondents reported driving under the influence, a higher rate than for alcohol (41%) (Czech Republic national report, 2005).

From a law enforcement perspective, a number of European countries have tightened drug driving laws in the past decade, for example to stipulate mandatory toxicological tests in the case of fatal accidents or to enable roadside drug testing. Furthermore, increased traffic controls for drug driving have been tested, although approaches vary — controls typically take the form of behavioural ‘sobriety’ tests and/or device-based ‘quick’ screening (typically, saliva testing), which are later validated with urine and/or blood analyses (EMCDDA, 2007). Yet, the ‘operationalisation’ of penalties in a similar

<sup>(1)</sup> See [www.cannabisetconduite.fr](http://www.cannabisetconduite.fr) for information on the campaign, together with supporting studies.



way to the blood alcohol concentration (BAC) limits commonly used for drink driving is not as commonplace in Europe for cannabis as in the USA (Grotenhermen et al., 2005). Exceptions exist, however: Belgium and Luxembourg, for example, use a threshold of 2 ng THC/mL blood (Belgian national report, 2006; Luxembourg Ministry of Transport, 2007). Some states in the USA also provide blood THC concentrations to guide judicial practice.

Thus, driving under the influence of cannabis (DUIC) has become an increasingly important issue from a public policy and road safety perspective. Available evidence suggests that while the prevalence of DUIC in the general population is relatively low (Walsh and Mann, 1999), it is substantially higher in important subgroups of the population, in particular young, male drivers (Lenne et al., 2004). Among users of cannabis, and in particular those who seek treatment for cannabis problems, 50% or more may report DUIC at least once in the previous year (Albery et al., 1999; Macdonald et al., 2004a). As well, among young drivers in North America at least, the prevalence of DUIC is similar to or higher than the prevalence of driving after drinking (Adlaf et al., 2003; Asbridge et al., 2005).

While no data on trends in DUIC over time are available, if cannabis use increases in the population DUIC, it is likely that DUIC will increase as well. Thus, there is a clear need to assess the evidence on the impact of cannabis use on collision risk, in order to provide an evidence-based perspective to discussions of the magnitude of the DUIC problem and the need for legislative or programme action. The principal objective of this chapter is to examine critically the findings connecting cannabis and traffic crashes, and a second objective is to consider the problems in developing methods to assess cannabis impairment for legal purposes.

## Further reading

- Blows, S., Ivers, R., Connor, J., Ameratunga, S., Woodward, M., Norton, R. (2005), 'Marijuana use and car crash injury', *Addiction* 100: 605–611.
- Fergusson, D. (2005), 'Marijuana use and driver risks: the role of epidemiology and experimentation', *Addiction* 100: 577–578.
- Grotenhermen, F., Leson, G., Berghaus, G., Drummer, O., Krüger, H., Longo, M., Moskowitz, H., Perrine, B., Ramaekers, J., Smiley, A., Tunbridge, R. (2005), 'Developing science-based per se limits for driving under the influence of cannabis (DUIC). Findings and recommendations by an expert panel', International Association for Cannabis as Medicine.
- Lenne, M., Triggs, T., Regan, M. (2004), *Cannabis and road safety: a review of recent epidemiological, driver impairment, and drug screening literature*, Monash University Accident Research Centre, Victoria.



# Cannabis use and driving: implications for public health and transport policy

Robert E. Mann, Gina Stoduto, Scott Macdonald and Bruna Brands

## Impairment: effects of cannabis on performance

A substantial amount of information has accumulated on the effects of cannabis on human performance. Of particular interest here are those studies most relevant to the possible effects of the drug on driving behaviour. According to Maes et al. (1999), research measures can be grouped in the following categories: attention tests (simple and divided attention); vigilance tests (ability to sustain attention); auditory and visual tests (visual acuity, accommodation to darkness/light); reaction time (simple and choice reaction time); cognitive tests (e.g. digit/symbol substitution test, Stroop word/colour test, letter cancellation test); memory tests; mental arithmetic; flicker fusion test; visual–motor coordination tests; body sway; physiological measurements (EEG, eye movements, pulse, blood pressure); and self-awareness measures. Additionally, studies may involve simulated or actual driving tasks.

Several comprehensive reviews of this literature have emerged, and the results appear to be very consistent. A consistent conclusion is that the acute effect of moderate or higher doses<sup>(2)</sup> of cannabis impairs the skills related to safe driving and injury risk. Moskowitz (1985) concluded that marijuana use impairs driver performance under a variety of experimental conditions. Berghaus and Guo (1995) conducted a meta-analysis of 60 studies and concluded that marijuana causes impairment of every performance area connected with safe driving of a vehicle, such as tracking, psychomotor skills, reaction time, visual functions, and attention. Of these performance criteria, the most deterioration from marijuana use was found for measures of attention (e.g. the continuous performance task), tracking (e.g. the pursuit rotor task) and psychomotor skills (e.g. simple reaction time) (Coombs and McAndrews, 1994; Berghaus and Guo, 1995). Similar conclusions have been reached by other reviews (Hollister, 1981; Maes et al., 1999; Smiley, 1999; Ashton, 2001; O’Kane et al., 2002; Ramaekers et al., 2004; Lenne et al., 2004). Some authors have postulated that the various cognitive impairments mentioned previously are related to duration of drug use (Hall and Solowij, 1998). Johns (2001) notes that cannabis use can occasionally result in short-term

<sup>(2)</sup> See Corrigan, this monograph, for a discussion of dosage and the pharmacology and pharmacodynamics of cannabis.



psychiatric distress and even psychotic states, and that cannabis may provoke relapse and aggravate existing symptoms in people with major mental illnesses such as schizophrenia. In addition, potential withdrawal effects of heavy, long-term cannabis use, such as restlessness, insomnia, and anxiety, could also influence injury risk (Ashton, 2001).

Smiley (1999) concluded that marijuana impairs skills and ability. She speculated that drivers are aware of this impairment, which may prompt them to slow down and drive more cautiously, suggesting that experienced cannabis users can compensate for the deleterious effects of cannabis on driving skills. This compensation for the effects of the drug is a form of tolerance to its effects. Tolerance is defined as a reduction in response to a particular dose of a drug with repeated administration, or the requirement that larger amounts are needed to obtain the same drug effect (Kalant et al., 1971). Tolerance to cannabis over repeated administrations is observed in animal studies with cannabis (Ashton, 2001), but little systematic research on cannabis tolerance in humans is available. When considering the extent to which tolerance to cannabis might influence drivers, it is useful to consider possible parallels between tolerance to cannabis and tolerance to alcohol. Tolerance is observed for both drugs, and substantial research has addressed the issue of alcohol tolerance in humans (e.g. Vogel-Sprott, 1992). The impairing effect of alcohol on psychomotor tasks is readily observed. However, under conditions where reinforcement is provided for non-impaired performance, tolerance will develop over a series of drinking sessions (Mann and Vogel-Sprott, 1981; Beirness and Vogel-Sprott, 1984), and the extent of tolerance development is related to awareness of impairment and efforts to compensate (Mann et al., 1983). Nevertheless, impairment returns when reinforcement contingencies are withdrawn (Mann and Vogel-Sprott, 1981; Zack and Vogel-Sprott, 1993). This return of impairment indicates that even tolerant or experienced users will display impairment of psychomotor performance. Thus, the same process that Smiley (1999) suggested may alleviate performance deficits in experienced cannabis users has been extensively studied with human subjects in laboratory research with alcohol. These studies indicate that even in those who learn to compensate for a drug's impairing effects, substantial impairment in performance can still be observed under conditions of general task performance (i.e. when no contingencies are present to maintain compensated performance).

Other researchers have investigated the effects of cannabis combined with alcohol on laboratory performance measures. These studies have been stimulated in part by the apparent frequency with which both drugs are used together (Cimbura et al., 1990; Jonah, 1990; Stoduto et al., 1993; Walsh and Mann, 1999). In general, these studies typically, but not always, reveal that the effects of cannabis plus alcohol are greater than the effects of cannabis alone (Liguori et al., 2002; Chait and Perry, 1994). The research suggests that the effects of combining cannabis with alcohol on skills necessary for safe driving such as visual search and road tracking are either additive, in which the effects of both drugs together are roughly equivalent to adding the effects of the







two together, or multiplicative, in which the effects of the two drugs together are greater than the effects of the two individually (e.g. Robbe, 1998; Laemers and Ramaekers, 2001). In reviewing this literature, O’Kane et al. (2002) observed that alcohol’s effects are strongest on integrative tasks while the effects of cannabis are strongest on tasks requiring attention and psychomotor skills.

## Epidemiological studies on collision risk associated with cannabis use

Epidemiological studies are necessary to assess the impact of cannabis use on collision risk. In the past two decades, several studies have been published on the involvement of cannabis in collisions. In this review of the literature, conclusions from three types of studies will be drawn: (i) descriptive and analytical epidemiological studies on the prevalence of cannabis use through drug testing in injured drivers; (ii) studies of collision risk of clinical samples of cannabis users; and (iii) studies of collision risk among general populations of drivers. The purpose of this section is to review the available empirical research in order to assess the risks that cannabis may pose for traffic collisions. This assessment of risk is central to our understanding of the role of cannabis in traffic safety.

### Studies using drug tests of injured drivers to detect cannabis metabolites

Studies that obtained drug tests of urine, blood or saliva from injured drivers are included in this section. Also included are studies of special populations where drug tests were taken of drivers suspected of driving under the influence or of reckless driving. A large number of descriptive studies have been conducted where the blood or urine of injured drivers has been analysed for the presence of cannabis metabolites. Thirty-two studies were found. The research methodologies and results in terms of the proportion testing positive for cannabis metabolites are described in Table 1.

There have been many epidemiological studies that have reported drug tests of fatally and non-fatally injured drivers. The percentage of fatally injured drivers testing positive for cannabis ranged from 1.4 to 27.5% (mean = 10.7%); while for non-fatally injured drivers the percentage ranged from 5 to 15.7% (mean = 11.5%) (Macdonald et al., 2003). The prevalence rates for cannabis are highest for the special driver populations, that is, those suspected of drug or alcohol impairment or reckless driving. The percentage of impaired or reckless drivers testing positive for cannabis ranged from 7.4 to 65.9% (mean = 34.6%).

Although many studies have been conducted on the prevalence of positive drug tests among injured drivers, few studies incorporated control groups so that assessments

Table 1: Summary of study results on the percentage of injured drivers testing positive for cannabis

Reference	Jurisdiction	Consent required	% positive cannabis	Comparison group
Brookoff et al. (1994)	Memphis, Tennessee, USA	No	33%	No
Budd et al. (1989)	Los Angeles, California, USA	No	19.6% (preliminary), 18.5% (follow-up)	No
Christopherson et al. (1990)	Norway	No	31.5%	No
Cimbura et al. (1990)	Ontario, Canada	No	10.9% — drivers; 7.6% — pedestrians	No
Crouch et al. (1993)	Salt Lake City, Utah, USA	No	13%	No
Drummer (1995)	Melbourne, Australia	No	11%	Yes; drivers not responsible
Drummer et al. (2003)	Australian states: Victoria, New South Wales and Western Australia	No	13.5% fatally injured drivers	No
Dussault et al. (2002)	Quebec, Canada	No for fatal drivers; yes for controls	19.5% for fatal drivers; 6.7% for controls	Yes
Everest and Tunbridge (1990)	England and Wales	No	2.6%	No
Fortenberry et al. (1986)	Alabama, USA	No	11% — drivers; 5% — passengers; 1% — pedestrians	No
Holmgren et al. (2005)	Sweden	No	33 cases positive for THC	No
Kintz et al. (2000)	Strasbourg, France	No	9.6%	No
Laumon et al. (2005)	France	No	At-fault drivers — 8.8%; control drivers — 2.8%	Yes; 3 006 not-at-fault fatally injured drivers

Study group	Comments
150 drivers stopped for reckless driving	12% positive for both cocaine and cannabis. 18.7% positive for alcohol (0.03–0.21 mg/dL)
Preliminary study: 102 fatally injured drivers. Follow-up study: 492 fatally injured drivers	18.6% positive for alcohol + cocaine/cannabis/both (preliminary). 16.2% positive for alcohol + cocaine/cannabis/both (follow-up)
3 159 drivers suspected of driving under the influence of alcohol and drugs	One or more drugs present in 67%
1 169 fatally injured drivers, 225 fatally injured pedestrians (aged 14 or over)	9.2% positive for cannabis + alcohol (drivers). 5.8% positive for cannabis + alcohol (pedestrians)
168 fatally injured truck drivers	Impairment due to cannabis use in all cases where THC level exceeded 1.0 ng/mL. 2.3% positive for cannabis + alcohol. 20% of accidents positive for drugs had driver fatigue
1 045 fatally injured drivers, 1990–93	Responsibility analysis conducted. No statistical significance for cannabis
3 398 fatally injured drivers, 1990–99	11.8% positive for car drivers; 22.2% positive for motorcycle drivers; 6.5% positive for truck drivers; 15.9% positive for single vehicle crash; 11.1% positive for multiple vehicle crash; 10.9% positive for 1990–93; 13.5% positive for 1994–6; 15.6% positive for 1997–9
354 fatally injured drivers; 11 952 roadside controls	Fatalities were significantly associated with positive tests for cannabis in the case-control study. No significant relationship was found for the responsibility analysis. Selection bias due to the 49.6% response rate of providing a urine sample for the control group could have inflated the odds ratios
1 273 fatalities (drivers, passengers, motorcycle drivers, pedestrians)	8.3% of those positive for drugs were also positive for alcohol (> 0.08 mg/100 mL)
510 fatally injured drivers, passengers, and pedestrians with urine samples	8.8% positive for both cannabis + alcohol
855 fatally injured drivers	
198 injured drivers (car, motorcycle, truck, bicycle) aged 13–57	
6 766 at-fault fatally injured drivers	Cannabis increased fatal collision risk in a dose-related manner after controlling for alcohol, age, type of vehicle and time of crash

Table 1: Summary of study results on the percentage of injured drivers testing positive for cannabis (continued)

Reference	Jurisdiction	Consent required	% positive cannabis	Comparison group
Logan and Schwilke (1996)	Washington State, USA	No	11%	No
Longo et al. (2000a,b)	Australia	No	10.8%	Yes; non-culpable drivers
McBay (1986)	Los Angeles, California, USA	No	13.4%	No
McLean et al. (1987)	Tasmania, Australia	No	6% of total sample	Yes; 387 blood donors
Marquet et al. (1998)	France	No	drivers — 13.9%; patients — 7.6%	Yes; 278 non-injured patients, aged 18–35
Mason and McBay (1984)	North Carolina, USA	No	7.8%	No
Mercer and Jeffery (1995)	British Columbia, Canada	No	13%	No
Movig et al. (2004)	The Netherlands	Yes	12% hospitalised drivers; 6% controls	Yes; 816 roadside survey controls
Mura et al. (2003)	France		10% of drivers, 5% of controls	Yes; 900 controls admitted to emergency room of six hospitals
Orsay et al. (1994)	Chicago, Illinois, USA	No	7.4% of total sample	Yes; 300 non-impaired, injured drivers
Peel and Jeffrey (1990)	Canada	No	20% of impaired drivers	No
Poklis et al. (1987)	St Louis, Missouri, USA	No	47%	No
del Rio and Alvarez (2000)	Northern Spain	No	1.4%	No
Risser et al. (1998)	Vienna, Austria	Yes	47% of 19 samples in 1993; 72% of 99 samples in 1996	No
Seymour and Oliver (1999)	Strathclyde, Scotland	No	39% of impaired drivers	Yes; 151 fatally injured drivers

Study group	Comments
347 fatally injured drivers	10% positive for alcohol + drugs; 15% positive for drugs alone; 63% of cannabis users positive for alcohol
2 500 injured drivers admitted to an ER	7.1% tested positive for cannabis-only. Blood tests taken — most drivers who tested positive for THC acid, the inactive metabolite
2 610 fatally injured drivers	2.8% of drivers were positive for cannabis without any other drug; 28% positive for drugs + alcohol
194 road users (42 fatally injured, 37 accident survivors, 115 breath-tested drivers/riders)	8% of those positive for alcohol (>0.5 g/L) had also used cannabis. Non-significant differences in drug use between groups
296 injured drivers, aged 18–35	Prevalence of cannabis among female drivers was significantly higher than for female patients ( $P < 0.05$ )
600 fatally injured drivers	11% positive for alcohol + drugs; 2.8% positive for drugs alone
227 fatally injured drivers	11% positive for alcohol + drugs
110 injured drivers admitted to hospital	Urine/blood test determined drug positivity. 39% of injured drivers had urine test versus 85% of controls had urine test. Effect of cannabis on risk of injury accident not significant
900 injured (non-fatal) drivers	10% injured drivers positive for THC, 5% of controls positive for THC. Among under-27-year-olds, cannabis increased collision risk significantly
285 alcohol or drug-impaired, injured motorists and motorcyclists	Impaired drivers had higher injury severity scores than control drivers ( $P < 0.001$ ). Impaired drivers more frequently involved in collisions, cited for moving violations; found to be at fault
492 cases: 94 injured; 172 impaired and 226 fatally injured drivers	Of 53 impaired drivers, 4% positive for cannabis
137 drug positive DUI drivers, Jan. 1983 to May 1986	32 different drugs detected
285 fatally injured drivers	Of all positive for drugs, 19.6% were also positive for alcohol
205 reckless drivers from 1993 to 1996, aged 17–24 years. 199 car drivers; six motorcycle drivers	Increase in cannabis use increased significantly over time ( $P < 0.05$ )
752 drivers suspected of being impaired	Drugs were present in 19% of fatally injured drivers; polydrug use was prevalent; alcohol detected in 33%

Table 1: Summary of study results on the percentage of injured drivers testing positive for cannabis (continued)

Reference	Jurisdiction	Consent required	% positive cannabis	Comparison group
Soderstrom et al. (1995)	Baltimore, Maryland, USA	No	12%	No
Stoduto et al. (1993)	Toronto, Ontario, Canada	No	13.9%	No
Sugrue et al. (1995)	Sydney, Australia	No	15.2% drivers (> 100 ng/dL); 8% cyclists (> 200 ng/dL); 13% passengers (> 200 ng/dL); 14% pedestrians (> 200 ng/dL)	No
Terhune and Fell (1982)	Washington DC, USA	No	10%	No
Williams et al. (1985)	California, USA	No	37%	No

of relative risks could be estimated. The best methodological studies are analytic epidemiological studies that utilise the case–control method (Meulemans et al., 1996; Marquet et al., 1998; Dussault et al., 2002; Mura et al., 2003). However, these studies are very difficult to conduct, and other investigators have used methods based on analysis of crash responsibility (e.g. Drummer, 1995; Longo et al., 2000a,b; Dussault et al., 2002; Drummer et al., 2004) (see Table 1). The logic of these studies is that if a drug increases collision risk, drivers under the influence of the drug are more likely to be considered responsible for the collision based on police reports (Terhune and Fell, 1982).

In a case–control study conducted in France, 296 injured drivers at emergency room departments and 278 non-injured control patients matched by age were urine tested for the presence of cannabis (Marquet et al., 1998). Methodologically, this study is unique among case–control studies in the field because consent was not required for urine tests of either cases or controls and, therefore, the results are free of selection biases. Results indicated that drivers testing positive for cannabis were not significantly more likely than controls to be involved in collisions. However, when the analyses were restricted to women only, the relationship became significant (Marquet et al., 1998).

Findings of another case–control study have recently been reported for 354 fatally injured drivers and 5 931 roadside controls in Quebec (Dussault et al., 2002). The odds ratio was statistically significant and indicated that fatally injured drivers were 2.2 times

Study group	Comments
1 338 injured (1 077 car drivers; 261 motorcyclists)	
339 injured drivers admitted to trauma unit (291 car drivers; 48 motorcyclists)	16.5% positive for alcohol + drugs
Total 262 (164 injured drivers, 12 pedal cyclists, 31 pedestrians, 55 passengers)	16% positive alcohol + drugs
500 injured drivers	25% positive for alcohol
440 fatally injured male drivers aged 15–34	Percentage of crash responsibility increased significantly from zero drugs to two or more detected drugs ( $P > 0.001$ ); 81% of cannabis users positive alcohol

more likely to test positive for cannabis than controls. However, this result should be treated cautiously owing to the possibility of systematic bias in the study. Little bias is likely for the proportion testing positive among the fatal drivers (19.5%); however, for the control group, consent was required by participants to provide a urine test. Only 49.6% of controls agreed to provide a urine sample. The authors used saliva samples to assess the degree of possible bias, with the rationale that the reason drivers refused both urine samples and saliva sample would be the same (fear of detection). The participation rate for saliva tests was 84.6%, which suggests that a large proportion of people found urine tests more invasive. The high rate of refusal to provide a saliva test indicates that the results should be interpreted with caution.

Meulemans et al. (1996) conducted a study where urine tests were taken from injured drivers at emergency rooms in Belgium. The authors examined injury severity of those in crashes. Being positive for cannabis metabolites was not significantly related to injury severity.

Mura et al. (2003) conducted toxicological tests on blood samples from 900 drivers involved in a non-fatal collision and 900 controls attending emergency rooms for non-traumatic reasons in France. Younger drivers (under 27) with cannabis alone in their blood were significantly more likely to be involved in collisions (OR = 2.5). This was somewhat less than the OR associated with alcohol alone (3.8), and when alcohol and cannabis were combined the OR for collision involvement increased to 4.6.

Several Australian studies have used responsibility analysis techniques and also had access to blood samples. Blood samples permit analyses of both the active and inactive ingredients of tetrahydrocannabinol (THC) and are the best approach for determining likely cannabis impairment. Longo et al. (2000a,b) obtained drug tests from 2 500 injured drivers. Their analysis found no significant differences in the degree of culpability associated with cannabis-positive compared with cannabis-negative drivers. Drummer (1995) examined the blood samples of driver fatalities linked with traffic reports in an Australian study. Similarly, he found no significant elevation of collision risk associated with cannabis use. More recently, Drummer et al. (2003, 2004) reported a responsibility analysis of 3 398 drivers killed in collisions in the Australian states of Victoria, New South Wales and Western Australia. Cannabis alone increased the likelihood of involvement in a fatal collision in a dose-related manner. The odds ratio (OR) for fatal collision involvement for those positive for cannabis only was 2.7; however, when analyses were restricted to those with concentrations greater than 5 ng/mL, the OR rose to 6.6.

A recent study from France employed responsibility analysis methods with a large sample of fatally injured drivers for whom blood samples were available. Laumon et al. (2005) reported on 10 748 drivers killed in France between October 2001 and September 2003. Blood levels of  $\Delta^9$ -tetrahydrocannabinol were compared in 6 766 drivers considered to be at fault for their collisions and 3 006 drivers, selected from the 3 982 other drivers, not considered to be at fault. These authors found that cannabis increased risk of involvement in a fatal collision in a dose-related manner, after controlling for presence of alcohol, age, type of vehicle and time of crash. The adjusted odds ratio for fatal collision involvement associated with blood levels of 5 ng/mL or over was 2.12. As well, these authors estimated that 2.5% of fatal crashes in France could be attributable to cannabis.

### Studies using clinical samples of cannabis abusers in treatment

The characteristics of studies using clinical samples of cannabis users in treatment are summarised in Table 2. We know from existing studies that clinical substance abuse populations are likely to drive after using cannabis. In one study, of a sample of 210 users in treatment for heroin dependency, 58 reported driving after drug use, and 62% of these reported driving at least once after using cannabis (Albery et al., 1999). In a study of those in treatment for alcohol, cannabis or cocaine abuse, 63% reported driving after use of cannabis (Macdonald et al., 2004a).

Few studies exist that examine collision risks experienced by clinical samples of individuals receiving treatment for cannabis. In the first of these studies, Smart et al. (1969) observed elevated collision rates in abusers of one or more drugs other than



Table 2: Studies of self-reported drug use and injuries in clinical samples

Reference	Jurisdiction	Comparison group	Research objective	Study group	Comments
Albery et al. (1999)	London, England	No	Examine collision rates among 210 out-of-treatment drug users	210 out-of-treatment drug users	62.1% of cannabis users drove at least once after using the drug; frequency of driving after using drugs was not significantly related to collisions
Macdonald et al. (2004b)	Toronto, Canada	Yes	What is the collision risk of cannabis abuse clients in treatment compared with population controls?	Treatment clients with a primary drug problem of cannabis, matched population controls	The cannabis clients had significantly more collisions before and after treatment
Mann et al. (1993)	Toronto, Canada	No	Examine the contribution of drug use to accident rates	144 male substance users, aged 21–40	50% of the accidents that occurred in the past 5 years occurred under the influence of alcohol and/or drugs
Mann et al. (1995)	Toronto, Canada	Yes	Evaluate the effects of substance abuse treatment on accident rates	137 males, aged 21–40, who were in treatment for substance use.	There were significant declines in number of accidents ( $P < 0.05$ ), drinking–driving convictions ( $P < 0.001$ ) and moving violations ( $P < 0.001$ ) after treatment
Smart et al. (1969)	Toronto, Canada	Yes	Investigate accident rates of abusers of one or more drugs other than alcohol	30 psychiatric patients	Patients had an overall accident rate 1.9 times larger than the expected rates



alcohol, but the sample was very small ( $n = 30$ ). In another study of 144 male substance abusers aged 21–40, Mann et al. (1993) examined collision rates in the year before entry into treatment and compared these rates to collision rates in the general male population of the same age. The subjects estimated that about 50% of their collisions in the preceding year occurred while they were under the influence of alcohol and/or drugs. As well, results suggested that the frequency of any substance use, as opposed to the use of specific substances, predicted collision involvement and significant post-treatment reductions were found in moving violations, DWI convictions, and total collisions (Mann et al., 1995).

A recent study examined the driving records of a large sample of cannabis abuse clients in treatment (Macdonald et al., 2004b). This study utilised blind linkage procedures a note to explain this method to avoid non-respondent bias, and compared the clinical sample to a randomly selected, frequency-matched (age, gender, location) control group of drivers. Significant elevations in collisions were found for abusers of cannabis compared with population controls, both prior and after treatment (Macdonald et al., 2004b). While this study demonstrates an association between cannabis abuse and elevated collision risk, alternative explanations for this relationship cannot yet be ruled out.

### Studies using general populations of drivers

Recently, Asbridge et al. examined the impact of self-reported DUIC on collision risk among high-school students in the four Atlantic provinces of Canada. These authors observed a significant elevation of collision risk ( $OR = 1.84$ ) among students who reported DUIC, after controlling for demographic factors, driver experience, and self-reported driving after drinking. Similarly, Mann et al. (2005) examined the association of collision risk with DUIC among a representative sample of adults surveyed in Ontario. Reporting DUIC in the past year increased significantly the odds of reporting a collision, after controlling for age, gender and other demographic variables ( $OR = 2.61$ ).

### General discussion of cannabis and collision risk

Early reviews of the literature on the association of cannabis use with collision risk concluded that conclusive demonstrations of cannabis use as risk factor for collisions did not exist (Robbe and O'Hanlon, 1993; Ferrara et al., 1994; Chesher, 1995; Christopherson and Morland, 1997; Hunter et al., 1998; Bates and Blakely, 1999; de Gier, 2000; Morland, 2000; Vingilis and Macdonald, 2002; Macdonald et al., 2003). However, more recent studies clearly suggest that cannabis use increases collision risk (e.g. Dussault et al., 2002; Mura et al., 2003; Drummer et al., 2004; Laumon et al., 2005;). Recent reviews of this literature are reflecting this growing body of studies finding a collision-enhancing effect of recent cannabis use (e.g. Kalant, 2004).



Numerous epidemiological studies have been found where drug tests were conducted of injured drivers. Early analytical epidemiological studies that used responsibility analysis or case-control methods did not provide clear proof that cannabis use is related to increased injury risk from collisions (Bates and Blakely, 1999). These studies often have poor statistical power because the presence of drug metabolites is relatively rare and large sample sizes are required to detect significant effects. To demonstrate that a relationship exists, much larger sample sizes are likely required with methodological approaches free of biases that could inflate odds ratios.

Several methodological issues complicate the use of some types of drug tests. For example, urine test results cannot be used to measure drug impairment, only whether drug use occurred sometime in the past, up to a few weeks for cannabis (Kapur, 1994). Since urine tests are detecting those that are not under the influence of cannabis, the measure lacks specificity and, therefore, extremely large sample sizes may be needed to find a statistically significant increase in collision rates for those testing positive. Blood tests offer a more promising approach for the assessment of whether drivers are more likely to be under the influence; however, because of their more intrusive nature, they may only be feasible for studies using responsibility analysis of fatally injured drivers. Few studies that use drug tests have control groups, thereby making it difficult to determine whether drug presence is a risk factor. The likely reason few studies include controls is that consent from this group is usually required. Consent is likely to discourage the participation of drug users more than non-users, which would translate into inflated relative risks or odds ratios. Some studies have used comparison groups of pedestrians; however, this approach is likely too conservative because the pedestrian could also be at fault.

Some studies have noted that different drugs are used in combination with each other, possibly resulting in increased risk for injury. Drug metabolites, for example, are often found in combination with alcohol. Therefore, it is important to separate out the relative role of other drugs from alcohol. Although many studies reported the proportion of collisions that involve alcohol, research has largely failed to separate out the role of alcohol from cannabis in collisions.

Under these circumstances other means to assess the contribution of cannabis to collision risk are useful. One approach is to examine collision risks of known heavy users of cannabis, such as people in treatment for a cannabis abuse problem. A recent study found cannabis clients have significantly elevated rates of collisions compared with population controls (Macdonald et al., 2004b). Another approach is to examine collision risks associated with self-reported DUIC in survey data. Recent studies have found that collision risks are significantly elevated in samples on adolescents and adults who report DUIC (e.g. Asbridge et al., 2005). However, studies of clinical groups or survey samples are limited in their ability to draw causal inferences, or to control for potential



confounders. Other factors may be causally related to both drug use and collisions. Recent studies and reviews on set variables, such as aggression (Beirness, 1993; Deffenbacher et al., 2000; Wiesenthal et al., 2000; Gidron et al., 2001), risk-taking/impulsiveness (Beirness, 1993; Jonah, 1997; Vavrik, 1997), stress (Veneziano and Veneziano, 1992; Simon and Corbett, 1996; Norris et al., 2000), fatigue (Horstmann et al., 2000; Masa et al., 2000; Connor et al., 2001) and criminality (Wells-Parker et al., 1986; Denison et al., 1997) confirm the importance of these characteristics in predicting collisions. Studies have found that many of the characteristics described above are over-represented in substance abuse populations, which might also explain higher collision rates. Withdrawal effects from cannabis, such as exhaustion, anxiety, agitation, mood swings and depression, and long-term effects of abuse, such as chronic sleep disruption, distractibility and depression (Cohen and Sas, 1993; Coombs and McAndrews, 1994; Herscovitch, 1996) could also increase risks.

One of the strengths of studies of clinical and survey samples is the accessibility and validity of information gathered. Although these studies suffer from the same limitations as survey studies of non-clinical samples, the biases related to self-reports are likely much less pronounced in the clinical samples. Since those who seek treatment have already acknowledged that they have a problem, they are more likely to provide accurate accounts regarding that problem. Good validity of self-reports has been established among substance users both during and after treatment (Hindin et al., 1994; Nelson et al., 1998).

## Detecting cannabis in drivers

The availability of accurate and simple-to-use breath tests for alcohol have been central to current efforts to reduce drink driving (Mann et al., 2001). There has been a continued interest in the development of a breath test for cannabis over the years, but to date no scientifically validated tests have been reported (Verstraete, 2000). Blood tests are the 'gold standard' for assessing levels of cannabis and metabolites in the body. Results of blood tests can be influenced by such factors as the temperature at which the sample is stored and binding to the inner surface of plastic vials (O'Kane et al., 2002). The logistic and legal issues involved in obtaining and testing blood samples from drivers suspected of DUIC are complex.

As noted earlier, the mere presence of cannabis in plasma may not indicate impairment. A current focus of research is to identify a relationship between THC in blood (and other body fluids) and behavioural change, drug influence and impairment (Martin and Cone, 1999). This has led to the suggestion that *per se* levels of cannabinoids in plasma may be identified for legal purposes, similar to the identification of *per se* levels for alcohol (Martin and Cone, 1999). Ramaekers et al. (2004), in considering this question, note





that meta-analyses of laboratory studies indicate that maximal performance impairment is seen at THC concentrations greater than 14 ng/mL in plasma or 7 ng/mL in whole blood. However, they note that the link between these levels and elevated collision risk has not been absolutely established.

Urine tests are used in situations where any relatively recent use of cannabis and other drugs is of interest (e.g. in sports, in addictions treatment), regardless of whether that use occurred in the previous few hours, days or even weeks. However, urine tests do not permit an accurate assessment of when drug use occurred (Kapur, 1994). A driver who has a positive urine test for cannabis may have used the drug in the preceding hours or days (or even weeks), and, thus, his or her driving skills may not be influenced by the drug at the time the sample is taken.

The detection of cannabinoids in saliva and sweat has been an active area of research. Current kits to measure saliva involve taking a swab from the mouth and include a rapid detection kit (O'Kane et al., 2002). Available data suggest that saliva THC levels arise from a drug that has remained in the mouth during smoking or ingestion, and initial data suggest that these levels are associated with degree of impairment observed (Menkes et al., 1991). The EU has run two projects, Rosita-1 and Rosita-2, to examine technology for enabling roadside drug screening. The first Rosita project in 1999–2000 established criteria for acceptable tests (sensitivity and specificity > 90%, accuracy > 95%) for amphetamines, benzodiazepines and cannabis. As rapid screening in a roadside situation should aim to be as non-invasive as possible, the Rosita-2 project aimed to evaluate the useability and analytical reliability of nine on-site oral fluid (saliva) drug testing devices between 2003 and 2005. Six European countries and four states in the USA took part. At the end of the period, none of those devices met the criteria proposed during the Rosita-1 project. Six devices registered a failure rate of greater than 25%. The procedure of obtaining the saliva samples varied greatly in terms of handling, quantities and acceptance by officials testing and persons tested, sometimes easy to perform, sometimes difficult to follow.

## Assessing behavioural effects of cannabis

There has been substantial recent interest in programmes involving the training of police officers and others to detect the physiological and behavioural effects of cannabis in individuals suspected of DUIC, and research on this topic is beginning to appear. Drug recognition expert (DRE) programmes have been developed to enable police officers to identify an individual who may be under the influence of a drug. These indicators can range from pupil size and body sway to the presence of drug paraphernalia in the vehicle. Walsh and Cangianelli (2002) reported that, in drivers suspected of driving under the influence of drugs (DUID) by DRE-trained police officers, subsequent blood

testing revealed that 32.5% were positive for at least one drug other than alcohol. This low level of sensitivity improved to 79.3% when officers were subsequently given an improved training programme. Tzambazis and Stough (2002) presented evidence that cannabis-induced impairment of performance on behavioural tests (standardized field sobriety tests, SFSTs) was significantly correlated with impairment of driving. Similarly, Papafotiou et al. (2004) showed that impairment of SFST performance increased with increasing dose of cannabis.

## Driving under the influence of cannabis legislation in Europe

Currently, European Union countries have legal provisions on driving under the influence of drugs but impairment must be proven in court in most countries (Moeller et al., 1999; EMCDDA, 2007). Germany (in 1998), Belgium (in 1999), Sweden (in 1999; Jones, 2004) and Finland (in 2003; Lillsunde et al., 2004) passed laws that allow for sanctions based on detection of drugs alone and other countries have proposed similar laws. This type of legislation depends on the police force's authority to collect human specimens at the roadside for testing or for confirmatory analysis, and this authority is regulated by other legislation that differs by jurisdiction. Some countries allow the police to control and test the public randomly and suspicion is not necessary for testing. However, the majority of countries treat roadside testing as an infringement of civil rights and suspicion is necessary for testing. Some countries have improved the process for initial suspicion by training the police to identify intoxicated drivers on the basis of physical and psychomotor signs.

Germany and Belgium currently use roadside testing devices routinely (sweat and urine are collected) and some countries have used urine or saliva or sweat test devices on an experimental basis with the driver's consent. Very few European countries have regulations prohibiting the use of roadside drug testing devices. However, many do not use these devices because of concerns regarding their validity or because of their unavailability. The preferred test is a single use, multi-parameter test, which is able to provide a clear, unambiguous test result within 5 minutes. According to Moeller et al. (1999), saliva is the preferred test specimen for cannabis due to its easy availability, low invasiveness and good correlation with impairment. Sweat was the second in preference because it allows testing without collaboration of the driver, and its low invasiveness and good availability at the roadside. Roadside drug screening is being trialled in a number of European Member States at the time of writing (EMCDDA, 2007). There have been some teething issues. For example, tests carried out in France in the summer of 2007 used three different devices and required the presence of a doctor for validating a urine sample. Introduction of *Drugwipe* saliva tests in Luxembourg in 2007 required explicitly by the Transport Ministry that the tests would not serve to incriminate drivers taking



legal medicines <sup>(3)</sup>. Portuguese police reported problems with a faulty batch of *Oratec-3* testing kits. Nonetheless, there is commitment at ministerial level to introducing saliva-based drug testing across many Member States.

## Conclusions

The impact of cannabis on traffic safety is an issue of substantial public and political interest at present and will likely continue to be of interest for some time. As has become clear in this review, there is a substantial amount of information available that can shed light on this issue, but in many areas the available evidence is sparse or unclear.

First, it appears clear that, in laboratory settings, cannabis impairs the skills thought to be necessary for safe driving. This impairment is not restricted to high levels of the drug (see earlier note that this dosage level may need some explanation) and occurs at the dosage levels that result from typical use of the drug. Tolerance may occur with continued use, but even individuals who have acquired tolerance to some of the effects of cannabis may demonstrate impairment on task performance. Combining alcohol with cannabis will result in an increase in the effects of cannabis, and the interaction could be multiplicative.

After alcohol, cannabis is the drug most often found in fatally and non-fatally injured drivers. In recent, studies cannabis has been found in up to 27.5% of dead drivers (Macdonald et al., 2003). However, epidemiological studies employing control groups are necessary to identify more precisely the contribution of the drug to collision causation. While earlier reviews of the literature were unable to conclude that cannabis increased collision risk, more recent studies employing larger samples and more rigorous methods are demonstrating with more consistency that recent cannabis use will increase collision risk (e.g. Mura et al., 2003; Drummer et al., 2004; Laumon et al., 2005). Studies employing clinical samples or using survey data provide additional indications of an increase in collision risk associated with cannabis use, however, in these studies the possibility that the increased risk may be due to factors other than the effects of cannabis cannot yet be ruled out.

Central to the problems of assessing the impact of cannabis on collision risk and to the problem of detecting cannabis-impaired drivers is the problem of measuring the presence of cannabis in the body. Difficulties in measuring cannabis in the body have hampered research on the effects of cannabis and the potential development of legal initiatives to address cannabis-impaired driving. Research is now assessing issues of dose–response effects on skills and behaviour. As well, measures that may assist in the

<sup>(3)</sup> See [www.gouvernement.lu/salle\\_presse/communiqués/2007/10/03lux/](http://www.gouvernement.lu/salle_presse/communiqués/2007/10/03lux/)



detection of DUIC (saliva tests, DRE programmes, standardized field sobriety tests) show promising results in field trials.

While much information is now available, there is a clear need for more research to determine the degree and nature of the association between cannabis use and collision risk. The impact of several variables on the cannabis–collision risk relationship needs to be examined, including personality characteristics such as risk-taking, aggression, criminality and stressful life events. Additional research to discover and validate easily administrable measures of cannabis use and impairment is also needed. Nevertheless, recent research has provided a much clearer picture of the contribution of cannabis to collision risk than was available only a few years ago.

## Bibliography

- Adlaf, E.M., Mann, R.E., Paglia, A. (2003), 'Drinking, cannabis use and driving among Ontario students', *Canadian Medical Association Journal* 168(5): 565–566.
- Albery, I., Strang, J., Gossop, M., Griffiths, P. (1999), 'Illicit drugs and driving: prevalence, beliefs and accident involvement among a cohort of current out-of-treatment drug users', *Drug and Alcohol Dependence* 58: 197–204.
- Asbridge, M., Poulin, C., Donato, A. (2005), 'Motor vehicle collision risk and driving under the influence of cannabis: evidence from adolescents in Atlantic Canada', *Accident Analysis and Prevention* 37: 1025–1034.
- Ashton, C. (2001), 'Pharmacology of cannabis: a brief review', *British Journal of Psychiatry* 178: 101–106.
- Bates, M., Blakely, T. (1999), 'Role of cannabis in motor vehicle crashes', *Epidemiologic Reviews* 21(2): 222–232.
- Beirness, D. (1993), 'Do we really drive as we live? The role of personality factors in road crashes', *Alcohol, Drugs and Driving* 9(3–4): 129–143.
- Beirness, D., Vogel-Sprott, M. (1984), 'Alcohol tolerance in social drinkers — operant and classical conditioning effects', *Psychopharmacology* 84: 393–397.
- Berghaus, G., Guo, B. (1995), 'Medicines and driver fitness — findings from a meta-analysis of experimental studies as basic information to patients, physicians and experts', in Kloeden, C. N., McLean, A. J. (eds), *Alcohol, drugs, and traffic safety — T'95*, University of Adelaide, Adelaide, Australia, 295–300.
- Brookoff, D., Cook, C., Williams, C., Mann, C. (1994), 'Testing reckless drivers for cocaine and marijuana', *New England Journal of Medicine* 331: 518–522.
- Budd, R., Muto, J., Wong, J. (1989), 'Drugs of abuse found in fatally injured drivers in Los Angeles county', *Drug and Alcohol Dependence* 23: 153–158.
- Chait, L., Perry, J. (1994), 'Acute and residual effects of alcohol and marijuana, alone and in combination, on mood and performance', *Psychopharmacology* 115: 340–349.
- Chesher, G. (1995), 'Cannabis and road safety: an outline of the research studies to examine the effects of cannabis on driving skills and actual driving performance', in *The effects of drugs (other than alcohol) on road safety, incorporating collected papers*, Government Printer, Melbourne, LV North, 67–96.
- Christopherson, A., Morland, J. (1997), 'Drugged driving, a review based on the experience in Norway', *Drug and Alcohol Dependence* 47: 125–135.





- Christopherson, A., Gjerde, H., Bjorneboe, A., Sakshaug, J., Morland, J. (1990), 'Screening for drug use among Norwegian drivers suspected of driving under the influence of alcohol or drugs', *Forensic Sciences International* 45: 5–14.
- Cimbura, G., Lucas, D. M., Bennet, R., Donelson, A. (1990), 'Incidence and toxicological aspects of cannabis and ethanol detected in 1394 fatally injured drivers and pedestrians in Ontario (1982–1984)', *Journal of Forensic Science* 35(5): 1035–1041.
- Coombs, R., McAndrews, M. (1994), 'The effects of psychoactive substances on workplace performance', in Macdonald, S., Roman, P. (eds), *Drug testing in the workplace*, Plenum Press, New York.
- Cohen, P., Sas, A. (1993), *Ten years of cocaine. A follow-up study of 64 cocaine users in Amsterdam*, University of Amsterdam, Amsterdam.
- Connor, J., Whitlock, G., Norton, R., Jackson, R. (2001), 'The role of driver sleepiness in car crashes: a systematic review of epidemiological studies', *Accident Analysis and Prevention* 33(1): 31–41.
- Crouch, D., Birky, M., Gust, S., Rollins, D., Walsh, J., Moulden, J., Quinlan, K., Beckel, R. (1993), 'The prevalence of drugs and alcohol in fatally injured truck drivers', *Journal of Forensic Sciences* 38: 1342–1353.
- Deffenbacher, J., Huff, M., Lynch, R., Oetting, E., Salvatore, N. (2000), 'Characteristics and treatment of high-anger drivers', *Journal of Counseling Psychology* 47(1): 5–17.
- Denison, M., Paredes, A., Booth, J. (1997), 'Alcohol and cocaine interactions and aggressive behaviors', in Galanter, M. (ed), *Recent developments in alcoholism, 13: alcohol and violence: epidemiology, neurobiology, psychology, family issues*, Plenum Press, New York, 283–303.
- Drummer, O. (1995), 'A review of the contribution of drugs in drivers to road accidents', in *Inquiry into the effects of drugs (other than alcohol) on road safety in Victoria, Incorporating Collected Papers*, LV North, Government Printer, Melbourne, 1–28.
- Drummer, O., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J. R. M., Robertson, M. D., Swann, P. (2003), 'The incidence of drugs in drivers killed in Australian road traffic crashes', *Forensic Science International* 134: 154–162.
- Drummer, O., Gerostamoulos, J., Batziris, H., Chu, M., Caplehorn, J., Robertson, M. D., Swann, P. (2004), 'The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes', *Accident Analysis and Prevention* 36: 239–248.
- Dussault, C., Brault, M., Bouchard, J., Lemire, A. (2002), 'The contribution of alcohol and other drugs among fatally injured drivers in Quebec: some preliminary results', in Mayhew, D. R., Dussault, C. (eds), *Alcohol, drugs and traffic safety — T'2002*, Société de l'assurance automobile du Québec, Québec, 423–430.
- EMCDDA (2007), *Annual report 2007. Selected issue on drugs and driving*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- Everest, J., Tunbridge, R. (1990), 'The incidence of drugs in road accident fatalities in Great Britain', in Perrine, M. (ed.), *Alcohol, drugs, and traffic safety — T'89*, National Safety Council, Chicago, 595–601.
- Ferrara, S., Zancaner, S., Snenghi, R., Berto, F. (1990), 'Psychoactive drug involvement in traffic accidents in Italy', in Perrine, M. (ed), *Alcohol, drugs, and traffic safety — T'89*, National Safety Council, Chicago, 260–264.
- Ferrara, S., Giorgetti, R., Zancaner, S. (1994), 'Psychoactive substances and driving: state of the art and methodology', *Alcohol, Drugs and Driving* 10: 1–55.
- Fortenberry, J., Brown, D., Shevlin, L. (1986), 'Analysis of drug involvement in traffic fatalities in Alabama', *American Journal of Alcohol Abuse* 12(3): 257–267.
- Gidron, Y., Davidson, K., Illia, R. (2001), 'Development and cross-cultural and clinical validation of a brief comprehensive scale for assessing hostility in medical settings', *Journal of Behavioral Medicine* 24(1): 1–15.



- de Gier, J. (2000), 'Review of European investigations of illicit drug prevalence in road traffic', in *Alcohol, drugs, and traffic safety — T'2000*, Stockholm, Sweden, 278.
- Hall, W., Solowij, N. (1998), 'Adverse effects of cannabis', *Lancet* 352(9140): 1611–1616.
- Herscovitch, A. G. (1996), *Cocaine: the drug and the addiction*, Gardner Press, New York.
- Hindin, R., McCusker, J., Vickers-Lahti, M., Bigelow, C., Garfield, F., Lewis, B. (1994), 'Radioimmunoassay of hair for determination of cocaine, heroin, and marijuana exposure: comparison with self-report', *International Journal of the Addictions* 29(6): 771–789.
- Hollister, L. E., Gillespie, H. K., Ohlsson, A., Lindgren, J.-E., Wahlen, A., Agurell, S. (1981), 'Do plasma concentrations of  $\Delta^9$  tetrahydrocannabinol reflect the degree of intoxication?' *Journal of Clinical Pharmacology* 21: 171S–177S.
- Holmgren, P., Holmgren, A., Ahlner, J. (2005), 'Alcohol and drugs in drivers injured in traffic accidents in Sweden during the years 2000–2002', *Forensic Science International* 151: 11–17.
- Horstmann, S., Hess, C. W., Bassetti, C., Gugger, M., Mathis, J. (2000), 'Sleepiness-related accidents in sleep apnea patients', *Sleep* 23(3): 383–389.
- Hunter, C., Lokan, R., Longo, M., White, J., White, M. (1998), 'Appendices to: The prevalence and role of alcohol, cannabinoids, benzodiazepines and stimulants in non-fatal crashes', Forensic Science Department for Administrative and Information Services, South Australia.
- Johns, A. (2001), 'Psychiatric effects of cannabis', *British Journal of Psychiatry* 178: 116–122.
- Jonah, B. A. (1990), 'Age differences in risky driving', *Health Education and Research* 5: 139–149.
- Jonah, B. A. (1997), 'Sensation seeking and risky driving: a review and synthesis of the literature', *Accident Analysis and Prevention*, 29(5): 651–665.
- Jones, A. W. (2004), 'Update on Sweden's zero-concentration law for narcotic drugs in blood of drivers', in Oliver, J., Williams, P., Clayton, A. (eds), *Alcohol, drugs and traffic safety — T2004*, Scottish Executive, Glasgow, UK.
- Kalant, H. (2004), 'Adverse effects of cannabis on health: an update of the literature since 1996', *Progress in Neuro-Psychopharmacology and Biological Psychiatry* 28(5): 849–863.
- Kalant, H., Leblanc, A. E., Gibbins, R. J. (1971), 'Tolerance to, and dependence on, some non-opiate psychotropic drugs', *Pharmacological Reviews* 23: 135–158.
- Kapur, B. (1994), 'Drug-testing methods and interpretations of test result', in Macdonald, S., Roman, P. (eds), *Drug testing in the workplace*, Plenum Press, New York.
- Kintz, P., Crimele, V., Mairot, F., Muhlmann, M., Ludes, B. (2000), 'Drug tests in 198 drivers implicated in non-fatal traffic accidents', *Presse Medicale* 29(23): 1275–1278.
- Laemers, C., Ramaekers, J. (2001), 'Visual search and urban city driving under the influence of marijuana and alcohol', *Human Psychopharmacology: Clinical and Experimental Research* 16: 393–401.
- Laumon, B., Gadegbeku, B., Martin, J.-L., Biecheler, M.-B. and the SAM Group (2005), 'Cannabis intoxication and fatal road crashes in France: population-based case-control study', *British Medical Journal* 331: 1371–1376.
- Lenne, M. G., Fry, C. L. M., Dietze, P., Rumbold, G. (2001), 'Attitudes and experiences of people who use cannabis and drive: implications for drugs and driving legislation in Victoria, Australia', *Drugs: Education, Prevention and Policy* 8(4): 307–313.
- Lenne, M., Triggs, T., Regan, M. (2004), *Cannabis and road safety: a review of recent epidemiological, driver impairment, and drug screening literature*, Monash University Accident Research Centre, Victoria.
- Liguori, A., Gatto, C., Jarrett, D. (2002), 'Separate and combined effects of marijuana and alcohol on mood, equilibrium and simulated driving', *Psychopharmacology* 163: 399–405.
- Lillsunde, P., Gunnar, T., Mykkanen, S., Seppa, H. (2004), 'Zero tolerance law for drugs and driving in Finland — effects on annual statistics', in Oliver, J., Williams, P., Clayton, A. (eds), *Alcohol, drugs and traffic safety — T'2004*, Scottish Executive, Glasgow, UK.

- Logan, B., Schwilke, E. (1996), 'Drug and alcohol use in fatally injured drivers in Washington state', *Journal of Forensic Science* 41(3): 505–510.
- Longo, M., Hunter, C., Lokan, R., White, J. M., White, M. A. (2000a), 'The prevalence of alcohol, cannabinoids, benzodiazepines and stimulants amongst injured drivers and their role in driver culpability. Part I: The prevalence of drug use in drivers and characteristics of drug positive group', *Accident Analysis and Prevention* 32: 613–622.
- Longo, M. C., Hunter, C. E., Lokan, R. J., White, J. M., White, M. A. (2000b), 'The prevalence of alcohol, cannabinoids, benzodiazepines and stimulants amongst injured drivers and their role in driver culpability. Part II: The relationship between drug prevalence and drug concentration, and driver capability', *Accident Analysis and Prevention* 32: 623–632.
- McBay, A. (1986), 'Drug concentrations and traffic safety', *Alcohol Drugs and Driving* 2(3–4): 51–59.
- Macdonald, S., Anglin-Bodrug, K., Mann, R., Erickson, P., Hathaway, A., Chipman, M., Rylett, M. (2003), 'Review: injury risk associated with cannabis and cocaine use', *Drug and Alcohol Dependence* 72: 99–115.
- Macdonald, S., DeSouza, A., Mann, R., Chipman, M. (2004a), 'Driving behaviour of alcohol, cannabis and cocaine abuse treatment clients and population controls', *American Journal of Drug and Alcohol Abuse* 30: 429–444.
- Macdonald, S., Mann, R., Chipman, M., Anglin-Bodrug, K. (2004b), 'Collisions and traffic violations of alcohol, cannabis and cocaine abuse clients before and after treatment', *Accident Analysis and Prevention* 36: 795–800.
- McLean, S., Parsons, R. S., Chesterman, R. B., Dineen, R., Johnson, M. G., Davies, N. W. (1987), 'Drugs, alcohol and road accidents in Tasmania', *Medical Journal of Australia* 147(1): 6–11.
- Maes, V., Charlier, C., Grenez, O., Verstraete, A. (1999), 'Drugs and medicines that are suspected to have a detrimental impact on road user performance' [www.rosita.org/](http://www.rosita.org/)
- Mann, R., Vogel-Sprott, M. (1981), 'Control of alcohol tolerance by reinforcement in nonalcoholics', *Psychopharmacology* 75: 315–320.
- Mann, R., Vogel-Sprott, M., Genest, M. (1983), 'Alcohol and cognitions: some preliminary observations', *Journal of Studies on Alcohol* 44: 900–905.
- Mann, R., Anglin, L., Vingilis, E., Larkin, E. (1993), 'Self-reported driving risks in a clinical sample of substance users', in Utzelmann, H. D., Berghaus, G., Kroj, G. (eds), *Alcohol, drugs and traffic safety — T'92*, TUV Rheinland, Cologne, Germany, 860–865.
- Mann, R., Anglin, L., Rahman, S., Blessing, L., Vingilis, E., Larkin, E. (1995), 'Does treatment for substance abuse improve driving safety? A preliminary evaluation', in Kloeden, C. N., McLean, A. J. (eds), *Alcohol, drugs and traffic safety — T'95*, NHMRC Road Accident Research Unit, University of Adelaide, Adelaide, Australia, 817–820.
- Mann, R., Macdonald, S., Stoduto, G., Bondy, S., Jonah, B., Shaikh, A. (2001), 'The effects of introducing or lowering legal per se blood alcohol limits for driving: an international review', *Accident Analysis and Prevention* 33: 569–583.
- Mann, R., Adlaf, E., Zhao, J. (2005), 'Cannabis use, driving after cannabis use, and collision involvement in the Ontario adult population', paper presented at the conference 'Issues of Substance', Markham, Ontario, 13–16 November.
- Marquet, P., Delpla, P.-A., Kerguelen, S., Bremond, J., Facey, F., Garnier, M., Guery, B., Lhermitte, M., Mathé, D., Pelissier, A.-L., Renaudeau, C., Vest, P., Seguela, J.-P. (1998), 'Prevalence of drugs of abuse in urine of drivers involved in road accidents in France: a collaborative study', *Journal of Forensic Sciences* 43(4): 806–811.
- Martin, B., Cone, E. (1999), 'Chemistry and pharmacology of cannabis', in Kalant, H., Corrigall, W., Hall, W., Smart, R. (eds), *The health effects of cannabis*, Addiction Research Foundation, Toronto, 21–68.

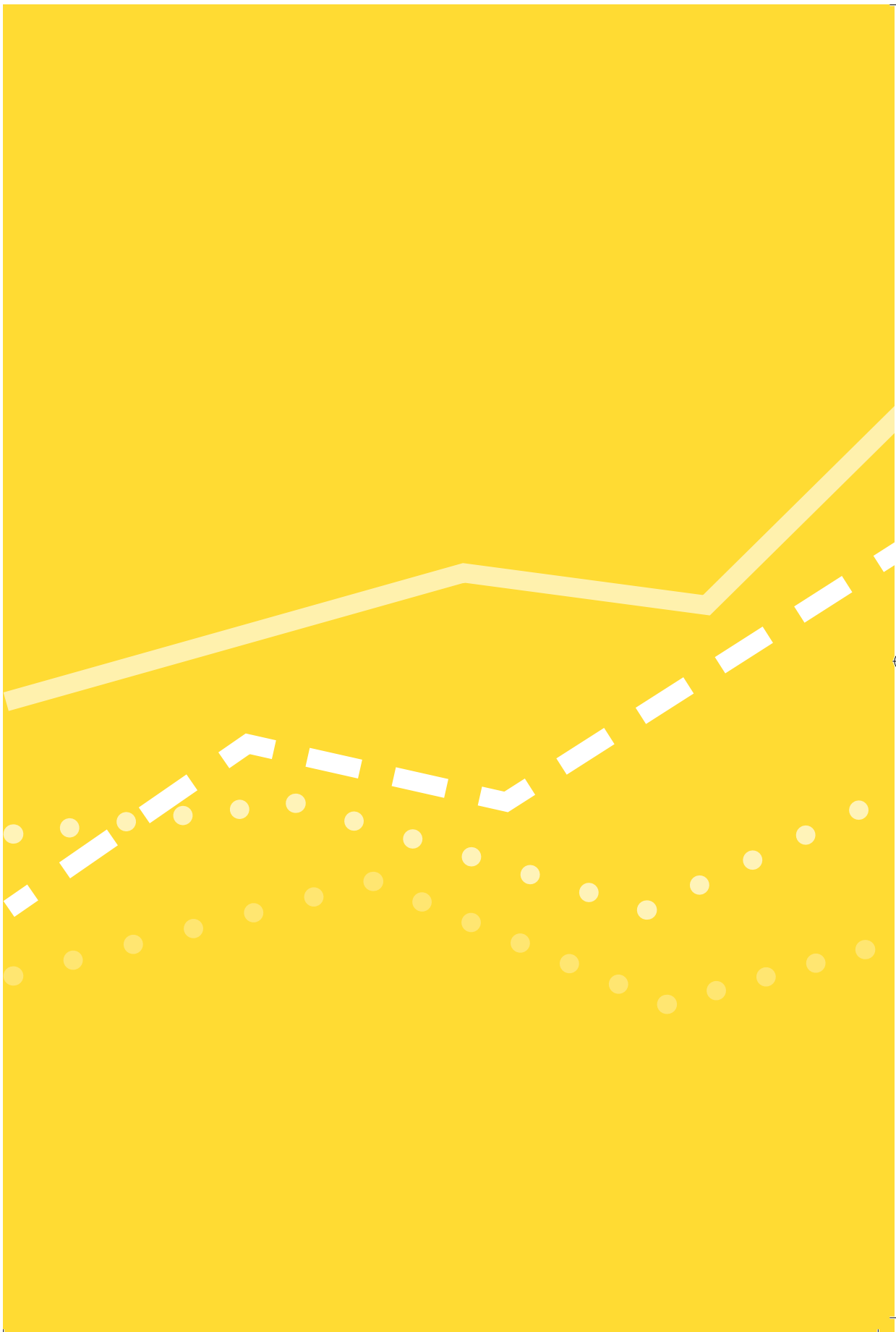
- Masa, J., Rubio, M., Findley, L. (2000), 'Habitually sleepy drivers have a high frequency of automobile crashes associated with respiratory disorders during sleep', *American Journal of Respiratory and Critical Care Medicine* 62(4): 1407–1412.
- Mason, A., McBay, A. (1984), 'Ethanol, marijuana, and other drug use in 600 drivers killed in single-vehicle crashes in North Carolina, 1980–1981', *Journal of Forensic Science* 29(4): 987–1026.
- Mason, A., McBay, A. (1985), 'Cannabis: pharmacology and interpretation of effects', *Journal of Forensic Science* 30: 615–631.
- Menkes, D. B., Howard, R. C., Spears, G. F. S., Cairns, E. R. (1991), 'Salivary THC following cannabis smoking correlates with subjective intoxication and heart rate', *Psychopharmacology* 103: 277–279.
- Mercer, G. W., Jeffery, W. K. (1995), 'Alcohol, drugs and impairment in fatal traffic accidents in British Columbia', *Accident Analysis and Prevention* 27(3): 335–343.
- Meulemans, A., Hooft, P., Van Camp, L., De Vrieze, N., Buylaert, W., Verstraete, A., Vansnick, M., Baumans, P., Bruynseels, P., Charlier, C., Corne, L., Decroix, O., Desmet, K., D'Orio, V., Fox, A., Haenecaert, G., Hardy, M. A., Hassoun, A., Hubloue, I., Millan, G., Leysens, L., Maes, V., Martens, F., Sabbe, M., Vanhaute, O., Vergnion, M., Wauters, A., Wenning, R. (1996), *Belgian toxicology and trauma study: une étude portant sur la présence d'alcool, de médicaments et de drogues illicites chez des conducteurs victimes d'accidents de la route*, Toxicological Society of Belgium and Luxembourg.
- Moeller, M., Steinmeyer, S., Aberl, F. (1999), *Operational, user and legal requirements across EU member states for roadside drug testing equipment*, University Homburg/Saar, Institute for Legal Medicine, Homburg, Germany.
- Morland, J. (2000), 'Driving under the influence of non-alcohol drugs', *Forensic Science Review* 12(1): 80–105.
- Moskowitz, H. (1985), 'Marihuana and driving', *Accident Analysis and Prevention* 17(4): 323–345.
- Movig, K., Mathijssen, M., Nagel, P., van Egmond, T., de Gier, J., Leufkens, H., Egberts, A. (2004), 'Psychoactive substance use and the risk of motor vehicle accidents', *Accident Analysis and Prevention* 36: 631–636.
- Mura, P., Kintz, P., Ludes, B., Goulier, J. M., Marquet, P., Martin-Dupont, S., Vincent, F., Kaddour, A., Goullé, J.-P., Nouveau, J., Mouslsma, M., Tihet-Courtet, S., Pourrat, O. (2003), 'Comparison of the prevalence of alcohol, cannabis and other drugs between 900 injured drivers and 900 control subjects: results of a French collaborative study', *Forensic Science International* 133: 79–85.
- Nelson, D., Kotranski, L., Semann, S., Collier, K., Lauby, J., Feighan, K., Halbert, J. (1998), 'The validity of self-reported opiate and cocaine use by out-of-treatment drug users', *Journal of Drug Issues* 28(2): 483–494.
- Norris, F., Matthews, B., Riad, J. (2000), 'Characterological, situational, and behavioral risk factors for motor vehicle accidents: a prospective examination', *Accident Analysis and Prevention* 32(4): 505–515.
- O'Kane, C., Tutt, D., Bauer, L. (2002), 'Cannabis and driving: a new perspective', *Emergency Medicine* 14(3): 296–303.
- Orsay, E. M., Doan-Wiggins, L. Lewis, R., Lucke, R., RamaKrishnan, V. (1994), 'The impaired driver: hospital and police detection of alcohol and other drugs of abuse in motor vehicle crashes', *Annals of Emergency Medicine* 24(10): 51–55.
- Papafotiou, K., Carter, J., Stough, C. (2004), 'An evaluation of the sensitivity of the Standardised Field Sobriety Tests (SFSTs) to detect impairment due to marijuana intoxication', *Psychopharmacology* 180(1): 107–114.
- Peel, H., Jeffrey, W. (1990), 'A report on the incidence of drugs and driving in Canada', *Canadian Society of Forensic Sciences Journal* 23: 75–79.
- Poklis, A., Maginn, D., Barr, J. (1987), 'Drug findings in "Driving Under the Influence of Drugs" cases: a problem of illicit drug use', *Drug and Alcohol Dependence* 20(1): 57–62.

- Ramaekers, J., Berghaus, G., van Laar, M., Drummer, O. (2004), 'Dose related risk of motor vehicle crashes after cannabis use', *Drug and Alcohol Dependence* 73: 109–119.
- del Rio, M. C., Alvarez, F. J. (2000), 'Presence of illegal drugs in drivers involved in fatal road traffic accidents in Spain', *Drug and Alcohol Dependence* 57(3): 177–182.
- Risser, D., Stichenwirth, M., Klupp, N., Schneider, B., Stimpf, T., Vycudilik, W., Bauer, G. (1998), 'Drugs and driving in Vienna', *Austria Journal of Forensic Sciences* 43(4): 817–819.
- Robbe, H. (1998), 'Marijuana's impairing effects on driving are moderate when taken alone but severe when combined with alcohol', *Human Psychopharmacology: Clinical and Experimental Research* 13: S70–S78.
- Robbe, H., O'Hanlon, J. (1993), *Marijuana and actual driving performance*, National Highway Traffic Safety Administration, US Department of Transportation, Washington DC, 9.
- Seymour, A., Oliver, J. (1999), 'Role of drugs and alcohol in impaired drivers and fatally injured drivers in the Strathclyde police region of Scotland, 1995–1998', *Forensic Science International* 103(2): 89–100.
- Simon, F., Corbett, C. (1996), 'Road traffic offending, stress, age, and accident history among male and female drivers', *Ergonomics* 39(5): 757–780.
- Smart, R., Schmidt, W., Bateman, K. (1969), 'Psychoactive drugs and traffic accidents', *Journal of Safety Research* 1: 67–73.
- Smiley, A. (1999), 'Marijuana: on-road and driving-simulator studies', in Kalant, H., Corrigall, W., Hall, W., Smart, R. (eds), *The health effects of cannabis*, Addiction Research Foundation, Toronto, 173–191.
- Soderstrom, C., Dischinger, P., Kerns, T., Trifillis, A. (1995), 'Marijuana and other drug use among automobile and motorcycle drivers treated at a trauma center', *Accident Analysis and Prevention* 27(1): 131–135.
- Stoduto, G., Vingilis, E., Kapur, B., Sheu, W.-J., McLellan, B., Liban, C. (1993), 'Alcohol and drug use among motor vehicle collision victims admitted to a regional trauma unit: demographic, injury, and crash characteristics', *Accident Analysis and Prevention* 25(4): 411–420.
- Sugrue, M., Seger, M., Dredge, G., Davies, D., Ieraci, S., Baumann, A., Deane, S., Sloane, D. (1995), 'Evaluation of the prevalence of drug and alcohol abuse in motor vehicle trauma in south western Sydney', *Australia and New Zealand Journal of Surgery* 65(12): 853–856.
- Terhune, K., Fell, J. (1982), 'The role of alcohol, marijuana and other drugs in the accidents of injured drivers', *Alcohol and Driving* 3(6): 3–6.
- Tzambazis, K., Stough, C. (2002), 'The SFST and driving ability. Are they related?' in Mayhew, D., Dussault, C. (eds), *Alcohol, drugs and traffic safety — T'2002*, Société de l'assurance automobile du Québec, Québec.
- Vavrik, J. (1997), 'Personality and risk-taking: a brief report on adolescent male drivers', *Journal of Adolescence* 20(4): 461–465.
- Veneziano, C., Veneziano, L. (1992), 'Psychosocial characteristics of persons convicted of driving while intoxicated', *Psychological Reports* 70(3): 1123–1130.
- Verstraete, A. G. (2000), 'Perspectives for the detection of cannabis in breath', in *Alcohol, drugs and traffic safety — T'2000*, Economy Press, Stockholm, Sweden, 337–341.
- Vingilis, E., Macdonald, S. (2002), 'Review: drugs and traffic collisions', *Traffic Injury Prevention* 3: 1–11.
- Vogel-Sprott, M. (1992), *Alcohol tolerance and social drinking*, Guilford Press, New York.
- Walsh, G., Mann, R. (1999), 'On the high-road: driving under the influence of cannabis in Ontario', *Canadian Journal of Public Health* 90: 260–263.
- Walsh, J., Cangianelli, L. (2002), 'New training in detection of illicit drugs in drivers', in Mayhew, D. R., Dussault, C. (eds), *Alcohol, drugs and traffic safety — T'2002*, Société de l'assurance automobile du Québec, Québec.



## Cannabis use and driving: implications for public health and transport policy

- Wells-Parker, E., Cosby, P., Landrum, J. (1986), 'A typology of drinking driver offenders: methods for classification and policy implications', *Accident Analysis and Prevention* 18(6): 443–453.
- Wiesenthal, D., Hennessey, D., Gibson, P. (2000), 'The Driving Vengeance Questionnaire (DVQ): the development scale to measure deviant drivers' attitudes', *Violence Victimization* 15(2): 115–136.
- Williams, A., Peat, M., Crouch, D. (1985), 'Drugs in fatally injured young male drivers', *Public Health Reports* 100: 19–25.
- Zack, M., Vogel-Sprott, M. (1993), 'Response outcomes affect the retention of behavioural tolerance to alcohol: information and incentive', *Psychopharmacology* 113: 269–273.









# Prevention and treatment



# PART III





## Chapter 10

# Treating cannabis use disorders: perspectives and best practices

**Keywords:** cannabis – meta-analysis – methodology – treatment

### Setting the context

One of the fears that has accompanied increasing cannabis prevalence in Europe is that more people, or rather more *vulnerable people*, are being exposed to problematic use. In particular, there are concerns about cannabis's role as a potential trigger or precipitator of mental health problems such as psychosis, depression, schizophrenia and anxiety (see this monograph's chapters by Witton, Hall and Montanari et al.). Anxiety has focused particularly on adolescents and young adults, the core cannabis-using demographic.

Few argue that more and more people — and in particular adolescents and young adults — are seeking professional help for cannabis problems. Cannabis treatment indicators were the topic of a selected issue in EMCDDA's 2004 Annual Report. Key findings were that 12% of all treatment clients and 30% of new clients to drug treatment recorded using cannabis as their main problem drug, and that a steady rise has been seen since the mid-1990s. The most recent data indicates that the share of those seeking help for cannabis among treatment clients has increased further to 20%, although the share of new clients has remained stable, at 29% (EMCDDA, 2007). Concerns about youth exposure to problems seem justified: nearly all cannabis clients new to treatment are under 30 years old, and the majority are male. Teenagers in specialised drug treatment are more likely to report cannabis as the primary drug.

Not surprisingly, health professionals — both specialists and general practitioners — are increasingly seeking advice on best practices for treating cannabis problems. While Chapter 14 by Rödner Sznitman is descriptive, answering the question 'What cannabis treatment is available in Europe today?', ideally, this chapter would now be prescriptive, detailing 'What cannabis treatment *should* be available in Europe today?'



Yet, this chapter cannot be prescriptive. As with other types of drug treatment, no 'gold standard' for cannabis exists. Nonetheless, there is some cause for optimism. The author finds that as cannabis treatment becomes more commonplace, the evidence base for 'what works' is likely to improve. What is more, the need to measure efficacy is increasingly being 'built into' emerging programmes from the start, as opposed to being tagged on as an afterthought.

Specialised cannabis treatment centres are being opened in a number of European countries — for example, in 2005, France opened 250 cannabis consultation centres, while promising psychosocial therapy development projects are underway, such as CANDIS in Germany and the five-country INCANT project (Belgium, Germany, France, Netherlands, Switzerland), and the Maria Youth Centre Project in Sweden (EMCDDA, 2007). The EMCDDA organised a Reitox academy in Berlin in March 2007 on cannabis prevention and treatment (see link below). Nonetheless, policymakers should perhaps bookmark this chapter with a large Post-it note reading 'research funding needed here'.

## Further reading

EMCDDA, Annual reports, published each year in November.

EMCDDA (2007), *Presentations at the Reitox Training Academy, on cannabis prevention and treatment* (29–30 March, Berlin)

<http://academy.emcdda.europa.eu/index.cfm?fuseaction=public.Content&nodeid=23154>

EMCDDA (2004), *Annual report 2004 — Selected issue on 'Cannabis problems in context — understanding the increase in European treatment demands on Cannabis treatment*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon

<http://ar2004.emcdda.europa.eu/en/page155-en.html>

Lundqvist, T., Petrell, B., Blomqvist, J. (2007), *Improvement in cognitive and social competence in adolescent chronic cannabis users — Results from a manual based treatment programme at Maria Youth Centre*, Stockholm, Sweden, Drug Addiction Treatment Centre, Lund University Hospital, Lund.

Projekt CANDIS website (2005–2007), <http://candis-projekt.de/cannabis.html>

Projekt INCANT website (2006–2007), [www.incant.de/](http://www.incant.de/)

# Treating cannabis use disorders: perspectives and best practices

Anders Bergmark

As in most other cases within the field of treatment of substance misuse there is no solid consensus concerning the specific effects of different treatment interventions for cannabis use disorders. Current cannabis treatment options are limited compared with those for alcohol and opiates and have only developed in recent years as the need for treatment has become more apparent. To a large extent the available knowledge-base is hard to interpret, due to a lack of standardisation of core components in clinical trials (such as client characteristics and comparison interventions). This challenge is compounded by the small amount of treatment studies to draw upon, and the reliance upon meta-analysis and reviews of clinical studies, which in itself is subject to flaws.

## A digression on the limitations of scientific reviews

When mapping the fast-developing field of cannabis treatment, it is crucial to take into account both the immaturity of the existing evidence base and the challenges of making clear-cut secondary reviews. So before reviewing current work on cannabis treatment, a didactic digression is included here to encourage peers to apply a critical eye when dealing with cannabis treatment. It reviews the doubts that have been cast on the existing evidence base for alcohol treatment, thus serving as a warning to cannabis treatment researchers to avoid similar pitfalls.

Recent years have seen a shift within scientific studies away from original studies and towards more 'exhaustive' reviews. It is no longer sufficient to underpin a clinical position by a single primary study or by synthesising a handful of primary studies, but to review *all* relevant studies. In some cases several hundred studies must be analysed. However, the resulting secondary studies need to be read critically, and there is considerable discussion on the limitations of reviews in clinical and psychological literature (Widiger et al., 1990; Deeks, 1998; Rosenthal and DiMatteo, 2001).

For substance treatment, there are three broad types of scientific review: the 'narrative review', the 'box-score review', and the 'meta-analysis'.

- Narrative reviews are conducted without an explicit systematic approach concerning the synthesis of the results of the primary studies that are included.

- Box-score reviews set out to differentiate between evidence by comparing any given treatment modality's proportion of positive findings vis-à-vis the total number of studies for that modality.
- Meta-analyses are built upon 'effect sizes' (ES), an index of treatment efficacy that enables the study to determine how a standard deviation in the results for one treatment group compares to control groups.

Although guidelines exist for how a review should be conducted, the majority of reviews — across many clinical fields — fail to follow them (Widiger et al., 1990; Breslow et al., 1998; Wilson, 2000; Altman et al., 2001; Bergmark, 2001). Over time 'narrative reviews' have become less important. While they are rarely without value — essentially relying upon the insight of the authors — they are not fit for analysing a large number of original studies and because they lack statistical analysis.

Meanwhile, the difficulties involved in producing valid box-score reviews have been underestimated, and this situation is not helped by the existence of competing reviews, that is reviews that reach contradictory conclusions from the same primary material (Petticrew and Kennedy, 1997). Finney (2000), a leading substance misuse treatment researcher, has provided strong arguments to favour pessimistic interpretation of existing research in the alcohol treatment field, and points to four major problems connected with box-score reviews:

- 1 lack of statistical power to identify differences between the intervention and control group;
- 2 multiple statistical tests for treatment effects;
- 3 variable comparison (control) groups across studies;
- 4 lack of consistent and adequate data on client characteristics across studies.

The number of clients in alcohol treatment studies is generally limited to a size that only gives a 50% chance to detect a medium-size effect at the  $P < 0.05$  level (Morley et al., 1996). This means that there is a substantial risk that conclusions concerning treatment effects are dependent on variation in statistical power among studies that are included in a review. It has been shown that studies on treatment settings that did detect positive differences in effects have an average probability of 77% to do so, whereas studies with negative findings only had a 55% chance to do the same (Finney et al., 1996). There is also a trend to compensate for weakness in statistical power; that is, the use of small groups of clients in studies by using a large number of tests without any regard for the type I error rate (Finney, 2000); that is, for false positive findings owing to the fact that a large number of tests will increase the probability for positive findings because of chance. In a study of settings effects it was found that studies that did identify positive effects had an average of 18.6 tests for the identified treatment effects, while those studies that did not identify any treatment effects had an average of 4.9 tests (Finney et al., 1996). A lack of standard procedure when it comes to the use

of comparison groups, that is the fact that there often is a great variation concerning what type of control condition is used within different studies, undermines the possibility of using original studies in reviews. It has been shown (Floyd et al., 1996) that only 30% of treatment studies used comparison groups that were exposed to no or minimal treatment, and as a consequence the identification of treatment effects will be dependent on which type of intervention the comparison group was subjected to. In a similar manner, the lack of information on relevant client characteristics constitutes a serious threat against the possibility of making comparisons between different studies. In a recent review of methodological issues (Floyd et al., 1996) more than two-thirds of the studies lacked information on how many years the clients have had substance misuse problems, and only 16% had any information concerning to what extent clients had received previous substance misuse treatment.

Meta-analysis is generally considered to be a better alternative than a box-score review. This is mainly because meta-analysis can avoid the serious bias connected to limited statistical power in the original studies by establishing so-called combined effect sizes. However, all the problems do not go away. As with box-score reviews there are substantial problems related to the lack of standardised comparison groups and an absence of information on relevant client characteristics. Combined, these problems bring Finney to conclude that currently, in the field of alcohol treatment, it is not possible to establish any synthesis that could direct an evidence-based practice about alcohol treatment.

It is telling that some of the most well-known researchers who have been extensively involved in such reviews have radically different views on whether existing reviews are inconsistent or not. For example, while Miller and Willbourne (2002) are encouraged by what they identify as considerable convergence between different reviews, Finney (2000) takes the opposite position.

## The scientific knowledge base for treatment of cannabis use disorders

### Meta-analyses

To date there have been two reviews that are specifically directed towards treatment of cannabis use disorders: SBU (2001; The Swedish Council on Technology Assessment in Health Care) and Fridell (2003). However, these two reviews, which both make use of meta-analytical techniques, arrive at two different qualitative answers to the question of whether any effective treatment for cannabis use disorders exist. They are in fact strongly related to each other: Fridell's study is an update of the SBU study (Fridell was the author of the chapter in the SBU study that dealt with psychosocial treatment for drug dependence). Most treatment approaches to cannabis use disorders involve



psychosocial approaches, which may include elements of psychological interventions such as cognitive-behavioural therapy or motivational interviewing or aspects of the client's environment, notably in interventions involving the client's family. But while the SBU study concluded 'there is no documentation of reliable effects for any psychosocial treatment for cannabis abuse' (p. 48, vol. II, author's translation), Fridell summarises his findings as follows: in 4 out of 13 published studies, behaviour therapy (pp. 5, 7) and family therapy (pp. 70, 88, 97) had a significant effect compared with control conditions for marijuana-smoking teenagers with a still-existing family network (p. 354).

The difference in the conclusion drawn in these reviews does not stem from the inclusion of new studies; although Fridell's study includes 13 studies and SBU 11, the two studies that were added to the former analysis were published in 1989 and 1982 (and should, according to the inclusion criteria stated in the latter analysis, also have been included in the SBU study). While the SBU study directly refers to the effect size (ES) of the meta-analysis that was undertaken for all psychosocial interventions, Fridell makes no explicit reference to the ES derived from his meta-analysis. Instead, he points to the fact that some treatment interventions have support for effects. But this approach begs the question why the overall meta-analysis was performed at all. To the extent that Fridell intended to evaluate the effects of specific treatment modalities, he should also have included the studies with no or weak effects that are included in the meta-analysis, otherwise the claim that behaviour and family therapy have support in some studies cannot be considered as meaningful (as the treatment modalities that are identified also are present in studies with no support for an effect).

While the meta-analysis in the SBU study produced an ES of 0.05 and, thus, points in the direction of no effects for psychosocial interventions for cannabis use disorders, Fridell's meta-analysis yields an ES of 0.24, that is, just above the 0.20 level which commonly is identified as the lower limit for a low ES (0.20–0.50; Cohen, 1978). The difference in ES from the two meta-analyses does not seem to be primarily connected to the inclusion of two new studies but to a difference in the estimated ES for three studies that are present in both studies. A study by Lewis is assigned an ES of 0.25 in SBU, while the corresponding value in Fridell's analysis is 0.49; a study of Joanning et al. (1992) has an ES of 0.63 in SBU and an ES of 1.01 in Fridell's analysis, and finally, a study by Henggeler et al. (1998) has an ES 0.54 in SBU and an ES of 0.93 in Fridell's analysis. Taken together, such inconsistencies undermine the possibility of interpreting the relationship between these two reviews and drawing conclusions that could guide practice. Thus, both the SBU's and Fridell's meta-analyses suffer from several of the problems dealt with in the preceding section. Neither of them considers the effects of the fact that there are important differences between the client groups in the studies included. Most importantly, neither distinguish between studies that only include adolescents and those directed towards adults. In the same fashion, there are no attempts to analyse the effects of the fact that there is a substantial variation in comparison groups between the studies that are included.





## Recent treatment studies

### Adolescent treatment

There are some new, substantial studies that are not included in SBU's or Fridell's analyses that underline the difficulties of identifying best practice. The most important is the CYT (cannabis youth treatment) study (Dennis et al., 2004). This multisite study sets out to analyse the effects of five different treatment interventions for adolescent cannabis use disorders. The design of the study aims at an identification of effects of treatment intensity as well as of treatment modalities. A combination of motivational enhancement treatment (MET) and cognitive-behavioural therapy (CBT) in five sessions was compared with the MET/CBT in 12 sessions and family support network (FSN, which was based on MET/CBT in 12 sessions and an addition of six parent education group meetings, four home visits, and case management). In a second trial of the study the five-session version of the MET/CBT intervention was compared with the adolescent community reinforcement approach (ACRA) and multidimensional family therapy (MDFT). While all the interventions led to improvements measured by days of abstinence and proportion of adolescents in recovery, the authors conclude, 'Overall, the clinical outcomes were very similar across sites and conditions' at 12-month follow-up. The study did not produce any support for the idea that an increase of the dosage of treatment had a differential effect on cannabis use, and neither did it provide any support for family-based treatment to being superior to the other interventions (which has been suggested for drug misuse in general, e.g. by Stanton and Shadish, 1997).

Brief interventions for adolescent cannabis users have been tested in a multisite study with non-treatment seeking adolescents in 10 educational colleges in London in the United Kingdom. At 3-month follow-up, the treatment group receiving a 1-hour face-to-face motivational interviewing session had reduced their weekly frequency of cannabis use by 66%, while a no-treatment control group had increased the weekly frequency of their cannabis use by 27% (McCambridge and Strang, 2004). These effects had diminished at 12-month follow-up, although cannabis use levels were significantly reduced from those at baseline (McCambridge and Strang, 2005).

### Adult treatment

Concerning treatment for adults with cannabis use disorders, six relevant studies that are not included in the analyses from SBU and Fridell have been published: MTP Research Group (2004), Copeland et al. (2001), Budney et al. (2000, 2006), Stephens et al. (2000), Carroll et al. (2006). The first three of these studies set out to study the differential effect of treatment dosage and to compare treatment interventions with a delayed treatment control (DTC). All studies establish a significant effect for all interventions compared with DTC, but in two of the studies (Copeland and Stephens)

there is no significant difference in effect between the minimal intervention and the more extensive intervention.

However, methodological aspects of these studies may have detracted from the potential benefits of longer treatments. Small numbers of cannabis users were studied and recruitment may have resulted in a sample of patients more likely to succeed in treatment. Less experienced therapists conducted the interventions in group settings rather than tailoring them to individual need, and they had abstinence from cannabis use as their goal. The multisite study, involving 450 mostly cannabis-dependent treatment seekers from three US states from the MTP Research Group (2004), attempted to avoid these shortcomings. In this study, outcomes from two interventions and a delayed treatment group were compared. Both interventions involved manual-based programmes flexible enough to be directed at individual requirements and included a moderation goal as well as abstinence. There was a more positive effect for the more intensive treatment intervention involving motivational and cognitive-behavioural elements, as well as practical issues such as transport, childcare and housing than an intervention involving two motivational enhancement sessions provided a month apart. While the study confirmed that brief interventions can lead to improvements, at each of the follow-up points at 3, 9 and 15 months those who had received the longer therapy showed greater improvements: using cannabis less often; greater reductions in symptoms of dependence and attaining abstinence in greater numbers. The results suggest that many cannabis-dependent patients might benefit from a one- or two-session intervention involving motivational interviewing combined with an introduction to ways of moderating use, while longer courses of motivational interviewing and cognitive-behavioural therapy should be available for those who need it (Ashton, 2005).

In the study by Budney et al. (2000), a contingency management approach was used. Contingency management usually involves providing patients with vouchers redeemable for goods and services in exchange for the patients provided drug-free urine tests, treatment attendance or medication compliance. The value of the vouchers can vary in order to reinforce desired outcomes. For example, in the recent Carroll et al. study with young cannabis-dependent adults, participants received a voucher worth USD 25 for the first session attended, with increases of USD 5 increments for each subsequent session attended. Participants also received USD 25 for each cannabis-free urine sample they provided after testing, which also increased in USD 5 increments to a maximum of USD 540 if all urine specimens provided during the course of the study were negative. Recent meta-analyses found effective outcomes from interventions using voucher-based and contingency management approaches compared with a range of control conditions (Lussier et al., 2006; Prendergast et al., 2006). The Budney et al. study randomised 60 cannabis-dependent adults to four individual sessions of motivational enhancement therapy (MET), 14 sessions of a MET and cognitive-behavioural

therapy (CBT) combination or a MET/CBT intervention together with contingency management. Although this study indicated that monetary incentives in the form of vouchers exchangeable for retail items increased abstinence in comparison to MET- and CBT-based interventions, the fact that no long-term follow-up was performed made it uncertain if this extrinsically motivated abstinence was sustained for a longer period of time. A subsequent study of these interventions by the same research group assessed outcomes for 12 months after treatment. Monetary incentives led to continuous periods of abstinence during treatment. CBT did not add to this during treatment effect but results showed that CBT did help with post-treatment maintenance of the initial positive effects of the vouchers. However, only half of the people in the study were able to achieve abstinence during the treatment and the majority continued to use cannabis after treatment and experience cannabis-related problems (Budney et al., 2006).

Another US study tested contingency management with young adults referred to treatment by the criminal justice service. Here 136, mainly male, cannabis-dependent probationers between the ages of 18 and 25 were randomised to one of four treatment conditions: a motivational enhancement/cognitive-behavioural intervention (MET/CBT) based on the manualised approach of the MTP study, either with or without a contingency management element; or individual counselling with or without contingency management. Contingency management was provided by incentives in the form of vouchers redeemable for goods or services dependent on treatment session attendance or submission of cannabis-free urines. The interventions with contingency management interventions had a significant positive effect on treatment retention and the number of cannabis-free urine specimens, with the motivational enhancement/cognitive-behavioural intervention with contingency management proving the most effective of the interventions. While there were few positive effects of MET/CBT compared with drug counselling during the treatment period, the patients receiving the MET/CBT intervention showed more signs of continuing improvement after treatment and continued to reduce their cannabis use when followed up at 3 and 6 months (Carroll et al., 2006).

In addition to the examination and evaluation of reviews and specific original studies with a bearing on treatment effects for cannabis use disorders, it might also be worthwhile to consider some results from more general reviews of drug misuse treatment interventions (Stanton and Shadish, 1997; Ozechowski and Liddle, 2000; Williams and Chang, 2000; Prendergast et al., 2002). The review by Prendergast et al. (2002) does not find any differences between treatment modalities, but Stanton and Shadish (1997), Ozechowski and Liddle (2000) and Williams and Chang (2000) all find support for family therapy (in different forms) as a more effective intervention than non-family modalities. But such findings are contradicted by the studies of Dennis et al. (2004) and Waldron et al. (2001). Multisystemic therapy (MST) (which must be considered as family based) has been cited by NIDA (the US National Institute on Drug Abuse) as an effective,

evidence-based treatment intervention, but a recent, Cochrane-based review by Littell et al. (2005) on MST comes up with the conclusion that MST has few if any significant outcomes compared with usual services or alternative treatments.

There is an ongoing study, Projekt CANDIS <sup>(1)</sup>, Targeted Treatment for Cannabis Disorders, at the Dresden University of Technology, due for completion in January 2008. CANDIS seeks to develop a modular treatment programme for cannabis use disorders based on treatment packages and components that have been shown to be effective in previous US and Australian trials (Copeland, 2001), and to adapt these materials to the needs of its target population (German-speaking problematic cannabis users over 16 years of age). The treatment package includes motivational enhancement, cognitive-behavioural and psychosocial problem-solving components. While results are not yet available at the time of publication, initial feedback is encouraging, with first results expected in November 2007 <sup>(2)</sup>.

## Pharmacological treatments

There have been a small number of studies assessing potential medications for the amelioration of cannabis withdrawal symptoms, all by the same research group and involving adult participants (Hart, 2005). Bupropion, a medication that has been found to be successful in treating nicotine dependence, was found to exacerbate some of the symptoms of cannabis withdrawal in a laboratory study involving non-treatment seeking regular cannabis users (Haney et al., 2001). Another laboratory study using nefazadone, an antidepressant with sedative abilities, found that the medication alleviated only some of the withdrawal symptoms (Haney et al., 2003). Divalproex, used in the treatment of epilepsy, mood disorders and migraine headaches, was found to worsen cannabis-associated withdrawal mood (Haney et al., 2004). Finally, administering doses of oral THC, at doses which did not produce subjective effects, was found to reduce withdrawal symptoms and reverse other effects associated with withdrawal, such as weight loss (Haney et al., 2004).

Naltrexone, an antagonist medication used in the treatment of opiate dependence, has been examined in relation to cannabis dependence. Antagonists block the effects of drugs by binding to receptors in the brain, with different antagonists working on different receptors and consequently blocking the effects of different drugs. Laboratory studies have demonstrated that opiates and cannabis share common receptors and animal studies have found that naltrexone can inhibit the development of cannabis dependence. However, human studies have found that naltrexone does not alter the subjective effects of low-dose oral THC and may also enhance the positive subjective effects of higher doses of oral THC (Haney et al., 2003).

<sup>(1)</sup> [www.candis-projekt.de](http://www.candis-projekt.de)

<sup>(2)</sup> E-mail communication with Dr Eva Hoch, CANDIS project leader, October 2006.

## Conclusion

By and large, it seems as if there is still no conclusive evidence for any specific treatment intervention concerning cannabis use disorders. On the other hand, there are indications that anything works. That is, that the treatment modality in itself is of less importance than the treatment context and the individual's choice to enter treatment. Support for this perspective is provided both by the CYT project (Dennis et al., 2004) and Project MATCH (Babor and Del Boca, 2003). In both of these projects, different treatment interventions produce the same (desired) outcome, although these outcomes did not seem to be facilitated by the stipulated theoretical mechanisms intended to produce these outcomes.

## Bibliography

- Altman, D., Schultz, K., Moher, D., Davidoff, F., Elbourne, D., Gotzsche, P., Lang, T. (2001), 'The revised CONSORT statement for reporting randomized trials: explanation and elaboration', *Annals of Internal Medicine* 134: 663–694.
- American Heart Association (2000), 'AHA Dietary guidelines', *Circulation* 102: 2284–2299.
- Ashton, M. (2005), 'Brief interventions short-change some heavily dependent cannabis users', *Drug and Alcohol Findings* 13: 10.
- Babor, T. F., Del Boca, F. K. (eds) (2003), *Treatment matching in alcoholism*, Cambridge University Press, Cambridge.
- Beck, U. (1999), *World risk society*, Polity Press, Cambridge.
- Bergmark, A. (2001), 'Psykosocial behandling av alkohol- och narkotikaproblem. Kan socialtjänsten dra några slutsatser?', *Nordisk Alkohol- och Narkotikatidskrift* 18: 501–513.
- Breslow, R., Ross, S., Weed, D. (1998), 'Quality of reviews in epidemiology', *American Journal of Public Health* 88: 475–477.
- Budney, A., Higgins, S., Radonovich, K., Novy, P. (2000), 'Adding voucher-based incentives to coping-skills and motivational enhancement improves outcomes during treatment for marijuana dependence', *Journal of Consulting and Clinical Psychology* 68: 1051–1061.
- Budney, A., Moore, B., Rocha, H., Higgins, S. (2006), 'Clinical trial of abstinence-based vouchers and cognitive-behavioral therapy for cannabis dependence', *Journal of Consulting and Clinical Psychology* 74(2): 307–316.
- Carroll, K., Ball, S., Nich, C., Martino, S., Frankforter, T., Farentinos, C., Kunkel, L., Mikulich-Gilbertson, S., Morgenstern, J., Obert, J., Polcin, D., Snead, N., Woody, G. (2006), 'Motivational interviewing to improve treatment engagement and outcome in individuals seeking treatment for substance abuse: a multisite effectiveness study', *Drug and Alcohol Dependence* 81: 301–312.
- Cohen, J. (1978), *Power analysis for the behavioural sciences*, Academic Press, New York.
- Cooper, H., Hedges, L. (1994), *The handbook of research synthesis*, Sage, New York.
- Copeland, J., Swift, W., Roffman, R., Stephens, R. (2001), 'A randomized controlled trial of brief cognitive-behavioral interventions for cannabis use disorder', *Journal of Substance Abuse Treatment* 21: 55–64.
- Deeks, J. (1998), 'Systematic reviews of published evidence: miracles or minefields?', *Annals of Oncology* 9(7): 703–709.
- Dennis, M., Godley, S., Diamond, G., Tims, F., Babor, T., Donaldson, J., Liddle, H., Titus, J., Kaminer, Y., Webb, C., Hamilton, N., Funk, R. (2004), 'The Cannabis Youth Treatment (CYT) study: main findings from two randomized trials', *Journal of Substance Abuse Treatment* 27: 197–213.



- Finney, J. (2000), 'Limitations in using existing alcohol treatment trials to develop practice guidelines', *Addiction* 95(10): 1491–1500.
- Finney, J., Hahn, A., Moos, R. (1996), 'The effectiveness of inpatient and outpatient treatment for alcohol abuse: the need to focus on the mediators and moderators of setting effects', *Addiction* 96: 1773–1796.
- Floyd A., Monahan, S., Finney, J., Morley, J. (1996), 'Alcoholism treatment outcome studies, 1980–1992: the nature of the research', *Addictive Behaviours* 21: 413–428.
- Fridell, M. (2003), 'Psychosocial treatment for drug dependence', in Berglund, M., Thelander, S., Jonsson, E. (eds), *Treating alcohol and drug abuse: an evidence based review*, Wiley-Vch, Weinheim, 325–413.
- Haney, M., Ward, A., Comer, S., Hart, C., Foltin, R., Fischman, M. (2001), 'Bupropion SR worsens mood during marijuana withdrawal in humans', *Psychopharmacology* 155: 171–179.
- Haney, M., Hart, C., Ward, A., Foltin, R. (2003), 'Nefazodone decreases anxiety during marijuana withdrawal in humans', *Psychopharmacology* 165: 157–165.
- Haney, M., Hart, C., Vosburg, S., Nasser, J., Bennett, A., Zubarán, C., Foltin, R.W. (2004), 'Marijuana withdrawal in humans: effects of oral THC or divalproex', *Neuropsychopharmacology* 29: 158–170.
- Hart, C. (2005), 'Increasing treatment options for cannabis dependence: a review of potential pharmacotherapies', *Drug and Alcohol Dependence* 80: 147–159.
- Henggeler, S. W., Schoenwald, S. K., Borduin, C. M., Rowland, M. D., Cunningham, P. B. (1998), *Multisystemic treatment of antisocial behavior in children and adolescents*, Guilford Press, New York.
- Joanning, H., Quinn, W., Thomas, F., Mullen, R. (1992), 'Treating adolescent drug abuse: a comparison of family systems therapy, group therapy, and family drug education', *Journal of Marital and Family Therapy* 18: 345–356.
- Kunz, R., Oxman A. (1998), 'The unpredictability paradox: review of empirical comparisons of randomised and non-randomised clinical trials', *British Medical Journal* 317: 1185–1190.
- Littell, J., Popa, M., Forsythe B. (2005), 'Multisystemic therapy for social, emotional, and behavioral problems in youth aged 10–17', *The Cochrane Library* 2005, issue 3.
- Lussier, J., Heil, S., Mongeon, J., Badger G., Higgins, S. (2006), 'A meta-analysis of voucher-based reinforcement therapy for substance use disorders', *Addiction* 101: 192–203.
- McCambridge, J., Strang, J. (2004), 'The efficacy of single session Motivational Interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: results from a multi-site cluster randomized trial', *Addiction* 99: 39–52.
- McCambridge, J., Strang, J. (2005), 'Deterioration over time in effect of Motivational Interviewing in reducing drug consumption and related risk among young people', *Addiction* 100: 470–479.
- McKee, M., Britton, A., Black, N., McPherson, K., Sanderson, C., Bain, C. (1999), 'Interpreting the evidence: choosing between randomised and non-randomised studies', *British Medical Journal* 319(6): 312–319.
- Marijuana Treatment Project Research Group (2004), 'Brief treatments for cannabis dependence: finding from a randomized multi-site trial', *Journal of Consulting and Clinical Psychology* 72(3): 455–466.
- Miller, W., Willbourne, P. (2002), 'Mesa Grande: a methodological analysis of clinical trials of treatment for alcohol use disorders', *Addiction* 97: 265–277.
- Morley, J. A., Finney, J., Monahan, S., Floyd, A. (1996), 'Alcoholism treatment outcome studies, 1980–1992: methodological characteristics and quality', *Addictive Behaviors* 21: 429–443.
- Moyer, A., Finney, J. (2002), 'Randomized versus nonrandomized studies of alcohol treatment: participants, methodological features and posttreatment functioning', *Journal of Studies on Alcohol* 9: 542–550.



- Ozechowski, T., Liddle, H. (2000), 'Family-based treatment for adolescent drug abuse: knowns and unknowns', *Clinical Child and Family Psychology Review* 3: 269–298.
- Petticrew, M., Kennedy, S. (1997), 'Detecting the effects of thromboprophylaxis: the case of the rogue reviews', *British Medical Journal* 315: 665–668.
- Prendergast, M., Podus, D., Chang, E. (2000), 'Program factors and treatment outcomes in drug dependence treatment: an examination using meta-analysis', *Substance Use and Misuse* 35(12–14): 1931–1965.
- Prendergast, M., Podus, D., Chang, E., Urada, D. (2002), 'The effectiveness of drug abuse treatment: a meta-analysis of comparison group studies', *Drug and Alcohol Dependence* 67: 53–72.
- Prendergast, M., Podus, D., Finney, J., Greenwell, L., Roll, J. (2006), 'Contingency management for treatment of substance use disorders: a meta-analysis', *Addiction* 101: 1546–1560.
- Rosenthal, R., DiMatteo, M. (2001), 'Meta-analysis: recent developments in quantitative methods for literature reviews', *Annual Review of Psychology* 52: 59–82.
- SBU(2001), Behandling av alkohol- och narkotikaproblem. En evidensbaserad kunskapsammanställning (volym I och II). SBU (Statens beredning för medicinsk utvärdering), Stockholm.
- Stanton, M., Shadish, W. (1997), 'Outcome, attrition, and family-couples treatment for drug abuse: a meta-analysis and review of the controlled, comparative studies', *Psychological Bulletin* 122: 170–191.
- Steinberg, K., Roffman, R., Carroll, K., Kabela, E., Kadden, R., Miller, M., Duresky, D.; The Marijuana Treatment Project Research Group (2002), 'Tailoring cannabis dependence treatment for a diverse population', *Addiction* 97 (Suppl.1): 135–142.
- Stephens, R., Roffman, R., Curtin, L. (2000), 'Comparison of extended versus brief treatments for marijuana use', *Journal of Consulting and Clinical Psychology* 68: 898–908.
- Stephens, R., Babor, T., Kadden, R., Miller, M.; The Marijuana Treatment Project Research Group (2002), 'The marijuana treatment project: rationale, design and participant characteristics', *Addiction* 97 (Suppl.1): 109–124.
- Waldron, H., Slesnick, N., Brody, J., Turner, C., Peterson, T. (2001), 'Treatment outcomes for adolescent substance abuse at four and seven-months assessment', *Journal of Consulting and Clinical Psychology* 69: 802–812.
- Widiger, T., Frances, A., Pincus, A., Davis, W. (1990), 'DSM-IV Literature reviews: rationale, process, and limitations', *Journal of Psychopathology and Behavioral Assessment* 12(3): 189–202.
- Williams, R., Chang, S. (2000), 'A comprehensive and comparative review of adolescent substance abuse treatment outcome', *Clinical Psychology: Science and Practice* 7: 138–166.
- Wilson, D. (2000), 'Meta-analyses in alcohol and other drug abuse treatment research', *Addiction* 95(Suppl. 3): 419–438.







# Chapter 11

## Cannabis prevention in the EU

**Keywords:** cannabis – EMCDDA – indicated prevention – judicial referrals – prevention – schools

### Setting the context

Cannabis is the most widely consumed illicit drug. It is targeted in one way or another by most prevention interventions. However, few interventions have targeted cannabis specifically. So cannabis prevention in Europe takes place in a vast and varied landscape. What may seem an abstract term — prevention — in practice diffuses across all manner of concrete programmes. These range from diplomacy and treaty negotiation, through health promotion by ministries and community schemes, to physical products such as pamphlets, videos and leaflets.

This chapter attempts to map the diversity of interventions in Europe within the three-tier ‘Gordon’ classification framework of *universal*, *selective* and *indicated* prevention. The chapter is illustrative rather than exhaustive. A general overview of prevention is made difficult because of the sheer diversity of prevention projects that have been developed. Moreover, the actors and implementers involved are far from uniform across Europe<sup>(1)</sup>.

What is certain is that the evidence base for cannabis prevention in the EU needs considerable work. Budgets for prevention campaigns in Europe run into tens of millions of euros, yet while considerable effort is spent on describing their scale (number of leaflets printed, number of advertisements aired, etc.) more research is needed into their effectiveness. Much knowledge originates from alcohol and tobacco prevention and from non-European studies (the USA in particular). While the evaluation of programmes

<sup>(1)</sup> An EMCDDA project monitors national drugs strategies across Europe, see [www.emcdda.europa.eu/?nodeid=1360](http://www.emcdda.europa.eu/?nodeid=1360)



## Cannabis prevention in the EU

has matured in Europe, the evidence base is too small to develop definitive conclusions for good practice. Political efforts should focus on evaluation and rigorous outcome evaluations.

## Further reading

- DrugInfo Clearinghouse (2005), *Prevention reading and resource list: Cannabis*, Melbourne.
- EMCDDA (2002), *Drugs in focus no. 5: Drug prevention in EU schools* — includes a short reading list.
- EMCDDA (ongoing), *Prevention and evaluation resources kit (PERK)*  
[www.emcdda.europa.eu/themes/prevention/perk](http://www.emcdda.europa.eu/themes/prevention/perk)
- Informa Healthcare (journal: six issues per year), *Drugs: Education, Prevention & Policy*.
- Matthys, N., Van Hal, G., Beutels, P. (2006), *Evidence based cannabispreventie in Vlaanderen, Onderzoek uitgevoerd in opdracht van Inge Vervotte, Vlaams minister van Welzijn, Volksgezondheid en Gezin*, Brussels.
- UNODC (2006), *Monitoring and evaluating youth substance abuse prevention programmes*, Vienna.

# Cannabis prevention in the EU

**Gregor Burkhardt**

This chapter focuses on a number of cannabis-specific prevention programmes in Europe. It also provides a brief overview of the rationale behind them. It must, nonetheless, be stressed that cannabis prevention rarely takes place in isolation. Furthermore, the weighting given to illicit drugs (cannabis included) in universal prevention has recently been eroded. Europe has shifted away from interventions that divide licit and illicit substances, and has moved towards an approach based on relative harms and complementary drugs, with particular focus on alcohol and tobacco in combination with illicit drugs prevention<sup>(2)</sup>.

## Cannabis in the context of polydrug prevention and health education

Cannabis prevention is typically delivered in the context of wider informational activities, and shares a platform with prevention for other substances — other illicit drug use, alcohol, tobacco and prescription drug misuse. Beyond substance use prevention, cannabis interventions are also frequently combined with public health prevention programmes that go beyond substance misuse, for example to cover personal health (mental health, addiction, healthy lifestyles, eating disorders, safe sex, etc.) and social education (citizenship, crime, ethics), particularly in the school environment.

A difficulty when analysing cannabis prevention activities is to identify, in this all-inclusive prevention environment, approaches that can offer insights specifically for cannabis. Reviews focusing specifically on cannabis prevention (e.g. Matthys et al., 2006) are rare. Yet, some formal approaches to analysing prevention have emerged, and prevention experts have in the past two decades begun to formalise their approach to analysing programmes, and a typology of interventions has emerged (*universal, selective, indicated* — see Box 1). This has enabled a more focused approach to evaluation of prevention initiatives.

For example, prevention can be categorised along criteria such as coverage (populations targeted), scope, duration, efficacy (what works in research conditions), effectiveness (what works in real life), resource-efficiency and cost-efficiency (what offers the best return on investment). A number of general evidence-based prevention manuals have been produced with European relevance<sup>(3)</sup>. However, cannabis-specific handbooks

<sup>(2)</sup> See EMCDDA (2006c).

<sup>(3)</sup> International examples include EU-Dap (2005); van der Stel (1998); UNODC (2002).

### Box 1: Prevention classification systems

Gordon (1987), Mrazek and Haggerty (1994) and Kumpfer and Baxley (1997) have proposed a three-tiered preventive intervention classification system: *universal*, *selective* and *indicated* prevention. Amongst others, this typology has gained favour and has been adopted by the US Institute of Medicine, National Institute of Drug Abuse (NIDA) and the EMCDDA.

*Universal prevention* strategies address the entire population (national, local community, school, district) and aim to prevent or delay the onset of alcohol, tobacco and other drug use. All individuals, without screening, are provided with information and skills necessary to prevent the problem.

*Selective prevention* focuses on groups who are either known to be drug users or at heightened risk of developing problems of substance abuse or dependence. The subgroups may be distinguished by characteristics such as age, gender, family history or economic status.

*Indicated prevention* involves a screening process, and aims to identify individuals who exhibit early signs of substance abuse and other problem behaviours. Identifiers include falling grades among students, known problem consumption or conduct disorders, alienation from parents, school and positive peer groups, and so on.

Outside the scope of this three-tier model are *environmental prevention* strategies. Environmental approaches are typically managed at the regulatory/legislative or community level, and focus on interventions to deter drug consumption. While prohibition can be viewed as the ultimate environmental restriction, in practice environmental strategies for cannabis include increased policing in sensitive settings (near schools, at music festivals), legislative guidelines aimed at precipitating punishments (warnings, penalties, fines) and actions to limit the prevalence of complementary licit drugs (for example, alcohol advertising bans and public place smoking bans).

Another classification scheme is *primary*, *secondary* and *tertiary* prevention. Primary prevention aims at preventing drug use and is usually the aim of universal programmes. Secondary prevention aims to prevent drug use from becoming problematic or leading to addiction. Tertiary prevention aims at preventing the harm caused by those who are using drugs.

On the borders of prevention and treatment is the strategy of early intervention. Based on detection of harmful alcohol or drug use, early intervention typically targets treatment of cases before they are aware that their substance use might cause problems or major psychosocial complications.

and guidelines on specific measures for cannabis are less common, yet do exist <sup>(4)</sup>. And despite considerable research effort, the prevention literature is largely weighted towards alcohol, smoking and general drug prevention (e.g. Aveyard et al., 2001; Loxley et al., 2004).

A panel of prevention experts recently commented that ‘(...) what we know about effectiveness (of illicit drug prevention) is almost entirely grounded in work with alcohol and tobacco’ (Stockwell et al., 2005). This is mostly due to the nature of the phenomenon. In order to reach statistical power for prevention effects on a low prevalence problem such as cannabis use in pre-teens, a much higher number of cases to be treated is needed compared with alcohol and tobacco.

## From informal to formalised programmes

As with misuse of other illicit drugs and alcohol, cannabis use is strongly associated with psychosocial risk factors that go beyond the drug’s pharmacological properties and patterns of use <sup>(5)</sup>. Those who use cannabis occasionally and those who use it frequently may have different risk factors, different problems, and may therefore benefit from different prevention and supportive approaches. Cannabis components of prevention in Europe are increasingly being formulated to reflect such specific needs. With regard to schools programmes, more countries than before have introduced, expanded or are planning more structured prevention programmes, and quality programmes have been prioritised in many Member States (EMCDDA, 2006a). In many respects, the information on drugs provided as part of these programmes has evolved in parallel with the evidence generated through relevant epidemiology and screening instruments <sup>(6)</sup>. As the most recent example in France, a 2005 MILDT/DGESCO addiction prevention guide, firmly based on epidemiology <sup>(7)</sup>, was tested at 80 schools and proposes sequencing

<sup>(4)</sup> Exceptions include: in Germany, *Schule und Cannabis* (BZgA, 2004) and materials for the *Bekifft in der Schule* project (SuchtPräventionsZentrum Hamburg, 2004); in Switzerland, *Ecoles et cannabis* (OFSP, 2004); in France, *Repérage précoce de l’usage nocif de Cannabis* (INPES, 2006); in the UK, *School drug policy: a review process* (Blueprint, UK Home Office, 2004) and *Advice for teachers on delivering drug education* (Drug Education Forum, 2004); in Belgium, *Maat in de Shit* (CAT Infopunt and VAD, 2006). A number of cannabis-specific prevention manuals have emerged in recent years from Australia (DrugInfo Clearinghouse, 2005), New Zealand and the USA (NIDA, 2003; see also Sloboda, this monograph).

<sup>(5)</sup> For a synthetic review of risk and protective factors, see Coggans, this monograph; Frisher et al. (2007); Dillon et al. (2006); Hawkins et al. (1991, 1992); Vázquez and Becoña (2000) and the website [www.drugsprevention.net](http://www.drugsprevention.net).

<sup>(6)</sup> See Hibell and Coggans, this monograph, for a discussion of epidemiology in schools and psychosocial correlates of cannabis use. See Beck and Legleye, this monograph, for discussion of screening instruments. The EMCDDA’s next monograph seeks to address harm reduction in general.

<sup>(7)</sup> The guide ‘Prévention des conduites addictives: Guide d’intervention en milieu scolaire’ is available at: <http://eduscol.education.fr/D0190/guide.htm>



## Cannabis prevention in the EU

prevention according to age group and substance focus: 11–12 years, tobacco; 13–14 years, alcohol; 15–16 years, cannabis; 17–18 years, polydrug consumption (French national report, 2006).

## Common ground on prevention

A standard EU approach to prevention is notably absent (see Reitox national reports). Nonetheless, the EMCDDA's annual report and EDDRA database have attempted to encourage pan-European awareness of what different Member States are doing. Encouragingly, cross-border collaboration is now more commonplace.

## Consistency yet gradation

There is a continuum between *drug-free society* prevention approaches and moderation approaches. For example, prevention policies might target younger groups with a *just say no* message (minimising onset and experimentation), experimenting youths with a *quit* message (minimising continuation, e.g. Germany's *Quit the Shit* programme), regular users with a *moderation* message (e.g. the UK *Talk to Frank Cannabis: Too much too often* guide, Belgium's *Maat in de Shit* peer-based approach), and heavy or problematic users with a *harm reduction* or *seek treatment* message. Prevention projects in Europe now show some gradation in objectives: to postpone (the next) consumption, to suspend use for some (extendable) time, to refuse offers, to reduce consumption, to distance oneself from consuming peers, etc. (Canning et al., 2004). However, the core scientific base remains consistent: all programmes emphasise the substance's illegality, risks and harms.

## Heterogeneous actors and settings

Delivery of cannabis prevention in Europe, as elsewhere in the world, may involve a range of actors: ministries (health and interior affairs), parliamentarians, teachers, police, the judiciary, health professionals, drugs workers, community groups, theatre groups, youth services, parents (including parents of former drug users), Scouts, churches and religious communities, charities and NGOs, the media and commercial publishers. In such a populous environment where materials are freely available, 'official' programmes may compete with programmes which are not officially endorsed<sup>(8)</sup>. This is particularly the case for selective programmes. Jones (2004)

<sup>(8)</sup> For a discussion of various non-governmental prevention materials producers and Internet materials, see Tammi and Peltoniemi (1999), 39–40. Some controversy has arisen in the activities of Narconon, affiliated to the Church of Scientology (Czech Republic national report, 2005; *The Sunday Times*, 7 January 2007).





highlights that moves towards selective prevention constitutes a general shift in which European drug prevention programmes have become increasingly expansive in nature as they attempt to influence complex social environments of risk. Attention should be paid to possible problems which ensue from this. While irresponsibility is rare, such competing publications are subject to little public health endorsement, and their neutrality depends largely on who publishes them<sup>(9)</sup>. For instance, different agencies may have different conceptions of vulnerability and risk behaviours, complicating interagency cooperation (Powell et al., 2003). Additionally, complications may arise from unsuccessful negotiation of boundaries between prevention, treatment and criminal justice agendas (Kimberlee et al., 2003). Indeed, research has shown that programmes tend to lose effectiveness as they are rolled out over time and across settings (Buston et al., 2002; Dusenbury et al., 2003).

### Environmental prevention strategies

Environmental prevention strategies (e.g. legislative and regulatory controls, taxes, bans, community and school rules) have gained popularity and are currently being introduced for alcohol, tobacco and cannabis in several EU Member States. While blanket prohibition could be seen as the strictest form of environmental strategy, there are many possible variations. These include: full and partial smoking bans in public places; EU-wide tobacco advertising bans; developments at EU level on a *European Alcohol Forum* to develop a code of conduct for reducing alcohol-related harm<sup>(10)</sup>; integration of roadside drug screening alongside drink driving tests; EU-wide indexation of existing minimum excise duties on alcohol; and alternative measures to criminal prosecution for personal cannabis possession. The level of enforcement of anti-smoking policies in EU Member States consistently correlates with the level of adolescent smoking (Aspect Consortium, 2004; Eurostat, 2002) and, without implying causality, there is appreciable correspondence between tolerant tobacco policies, prevalence of tobacco smoking among youth and prevalence of cannabis use (EMCDDA, 2006a). The vast majority of cannabis consumers are tobacco smokers. Inversely, there seems to be a strong intrinsic relationship between cannabis and cigarette smoking, in the sense that cannabis use perpetuates cigarette smoking (Amos et al., 2003).

Potential environmental prevention strategies for cannabis are limited by the illegal status of the drug<sup>(11)</sup>. Nonetheless, advertising controls on tobacco products or alcohol,

<sup>(9)</sup> Producers of non-official prevention-like materials include pro-drugs lobbyists, church groups (Christian, Islamic, Scientologists), parents-against-drugs and similar charities, and groups with strong commercial interests (for example, cannabis magazine publishers and seed sellers).

<sup>(10)</sup> <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/774&format=HTML&aged=0&language=EN&guiLanguage=en>

<sup>(11)</sup> For discussion of hypothetical environmental measures, see Room, this monograph.



## Cannabis prevention in the EU

together with anti-binge measures (such as happy hour restrictions) are proven to reduce consumption of these substances, and may have a knock-on effect on comorbid cannabis consumption, although little research exists on this topic.

Cannabis advertising is generally indirect in Europe, yet is, nonetheless, present. Advertisers include seed suppliers, growshops and head shops, cannabis smoking clubs and vendors of paraphernalia such as bongs and hydroponic equipment. Publicity channels include a burgeoning cannabis culture media — The High Times, Softsecrets, Pot-TV.net and the High Life trade fair — as well as general media (inflight magazines, music magazines, etc.). Mirroring the brand-stretching vogue that has accompanied tobacco marketing controls (Camel Active, Marlboro Classics) a number of products are marketed using cannabis or cannabis-leaf logos in Europe. As well as ‘directly associated’ products, such as bongs and cigarette rolling papers, products include Cannabis cough drops and Swiss Hemp Ice Tea drinks (Slovakian national report, 2005), and clothing and accessories, often manufactured with hemp (in France, brands include Made in Chanvre and Terre de Chanvre). Yet, controlling such marketing and cannabis products is very much a grey area. The Australian Federal Government has promoted legislation to ban the sale of bongs and drug equipment, with a ‘bong ban’ recently put in place in the state of Queensland, although the effects of such legislation need to be measured.

At the ‘micro’ level, structural prevention measures targeting the availability of cannabis and the social norms around legal drugs are less developed than the evidence base would advise. An advertising ban forms part of the AHOJ-G prosecution guidelines for Dutch coffee shops (see Korf, this monograph). Some Dutch municipalities are beginning to ensure coffee shops are not established in the vicinity of schools, while overall retail outlet density has decreased. Policing of smart shops and growshops has tended to maintain vigilance for any shops that cross legal boundaries and actually sell cannabis: a recent parliamentary proposal in Spain called for regulating *cañameries* (growshops). Meanwhile, some structural strategies have targeted the ‘periphery’ of substance use (e.g. municipal bans on drinking or drug-taking in public). Nonetheless, the apparent contradiction persists in Europe where advertisements for a legal product (e.g. tobacco) are banned yet not those for products relating to cannabis, an illegal drug.

## Universal prevention: school-based approaches and mass media campaigns

Universal, multi-substance prevention programmes are the norm across Europe, with the predominant focus on school-based and mass media approaches (EMCDDA, 2006a).





## Rationale

An important prevention rationale for universal school-based approaches is the gateway hypothesis, whereby delaying onset of adolescent alcohol, tobacco and cannabis use is hypothesised to reduce rates of subsequent illicit drug consumption and problematic use and other comorbid harms (e.g. truancy, delinquency). Other rationales include general health promotion and preventing comorbid behaviour such as harmful alcohol use, school drop-out rates, risky sexual behaviour, early sexual activity or pregnancies, violence and social exclusion. There is some evidence that preventing or delaying tobacco or alcohol use can reduce subsequent use of cannabis (Botvin, 2000; Caulkins et al. 2002, 2004; Ellickson et al., 2003), yet strong proof for reductions for 'harder' illicit drug use has proved both elusive and heavily contended in the USA (Gerstein and Green, 1993; Manski et al., 2001).

The political rationale for general universal prevention is robust<sup>(12)</sup>. Economies of scale are gained as the targeted population is large, while the health objectives — smoking, alcohol, drugs and obesity — are wide (Roe and Becker, 2005). By targeting youths and young adults, school-based and young adult-oriented programmes target a demographic where prevalence is highest, potential lifetime benefits the strongest, and, in many Member States at least, cannabis use is growing (EMCDDA, 2006a; Hibell et al. (ESPAD), 2003). Nonetheless, large-scale universal programmes also lead to high absolute cost, while covering large populations (low per-capita costs). Economic research into prevention cost-effectiveness remains both rare and perhaps politically sensitive in Europe.

## Content considerations

A typology of different kinds of universal prevention interventions has been produced for the EMCDDA's PERK project and reflects the developments of the last two decades<sup>(13)</sup>. It divides content into (Burkhart and Crusellas, 2002; McGrath et al., 2006; EMCDDA, 2007):

- knowledge of drugs (prevention by providing health information to influence decision-making);
- personal skills (clarification of values and encouragement of responsible decision-making);
- social skills (in particular, peer resistance);

<sup>(12)</sup> Political commitment to school-based prevention is intuitive, as seen in a recent letter to *Addiction*: 'If we do not have up-to-date evidence then we must fall back upon rationality and human and societal values, and I tend to agree (...) that alcohol education, in the absence of evidence, should continue to be valued.' (Foxcroft, D., *Addiction* 101: 1057–1059).

<sup>(13)</sup> [www.emcdda.europa.eu/index.cfm?fuseaction=public.Content&nNodeID=9753](http://www.emcdda.europa.eu/index.cfm?fuseaction=public.Content&nNodeID=9753)



## Cannabis prevention in the EU

- normative beliefs (myth correction, correcting overestimation of the 'acceptability of use');
- alternatives to drug use (activities that are deemed incompatible with drug use);
- structural or regulatory measures (reducing acceptance and availability of complementary substances such as tobacco and alcohol); and
- multi-component (a combination of these).

Debate is strong about the effectiveness of each approach, and there has been a shift away from 'traditional' or 'intuitive' prevention (knowledge and affective) to social skills, competence enhancement, and structural/regulatory and multi-component approaches based on scientific theory (Burkhart and Crusellas, 2002). Typical prevention approaches include theatre-based approaches (Canning et al., 2004) and, increasingly, IT- and Internet-based approaches (Tammi and Peltoniemi, 1999; Drugscope, 2006).

In terms of evaluating effectiveness of cannabis prevention programmes, Europe is, to a large degree, forced to look at US reviews which are furthermore focused on general substance prevention and not cannabis-specific prevention (Skara and Sussman, 2003; Faggiano et al., 2005; Thomas and Pereira, 2006). School-based approaches have generally been found to have scarce effects but — considering the methodological difficulties of implementation and research — they should not be underestimated (Milford et al., 2000; Gorman, 2002; Tucker et al., 2002; Coggans et al., 2003; Ellickson et al., 2003; Bühler and Kröger, 2006, Thomas and Pereira, 2006; Faggiano et al., 2005). Studies from Europe represent a small minority among those aimed at preventing drug use. For example, only one small study (Hurry and McGurk, 1997) was included in the Faggiano review. Among those aimed at preventing tobacco use, some failed to detect any effect (Eveyard et al., 2001) while others show inconsistent results across centres (de Vries et al., 2003) or no long-term yet limited short-term effects (Thomas and Pereira, 2006).

Beyond objections of societal comparability and applicability of general substance findings to cannabis, the US evidence is far from conclusive on programme content. The Cochrane (Faggiano) review suggests that skills-based approaches can reduce subsequent drug use compared with normal curricula. Another review in the USA (Skara and Sussman, 2003) found that 8 out of 25 studies examined programme effects on cannabis and all showed positive interim effects (3–24 months). However, only one study reported data that allowed the calculation of the percentage reduction compared with control groups and other studies did not have enough data to determine relative differences with control groups. Four studies provided long-term outcomes (24 months), of which two showed positive outcomes and two showed no significant differences. The programmes that showed positive outcomes for cannabis use were all based on the social influence model and the majority had more than one type of intervention. About half of these programmes used peer educators, as well as adults. Most had booster



sessions or a long-term component and the length of follow-up varied between 27 and 72 months.

### Best practices

Prevention research tends to be descriptive and available proof of effectiveness is limited. While the literature is almost universally cautious on making recommendations, there are several examples of organisations that have distilled research into actionable materials. Practice is informed by a number of international manuals (van der Stel, 1998; WHO, 2000; UNODC, 2002, 2006), synthetic monographs in the field (e.g. EMCDDA, 1997; Bukowski and Sloboda, 2003) and exemplary projects (Ferrer-Wreder et al., 2004; the EMCDDA EDDRA database and PERK). The EMCDDA's PERK project, the *Prevention and Evaluation Resources Kit*, aims to provide an online resource in the area.

NIDA's *Red Book* recommendations (NIDA, 2003) recur in many European publications. These are:

- target all forms of drug misuse, including alcohol and tobacco;
- be family-focused, including a component for parents;
- be long term across a school career;
- be age specific and culturally sensitive;
- address local problems and seek to strengthen community norms against drug use.

A study of prevention reviews (Cuijpers, 2002; Gottfredson and Wilson, 2003; Kumpfer et al., 2003; Skara and Sussman, 2003; Shepard and Carlson, 2003) lists the following guidelines, although with some caveats on the strength of recommendations (McGrath et al., 2006):

- Interactive approaches are preferable to didactic (ex cathedra) approaches.
- Peer-led approaches offer a mild increase in effectiveness.
- Social skills approaches are generally more effective, although resistance skills training offers little evidence of effectiveness.
- Booster sessions may help effectiveness, particularly for cannabis.
- Higher programme intensity (e.g. 10 lessons or more) offers little added benefit.
- Weak evidence suggests that programmes are best delivered to students 11–14 years old<sup>(14)</sup>.

<sup>(14)</sup> Frisher et al. (2007) suggest that the evidence for an 'optimal age group' for prevention is unclear, although results of late-teen interventions (> 17 years) are generally weaker. They also suggest that as problematic patterns of use typically appear in later adolescence (15–16 years), 'attempts to modify behaviour at this age may be more productive'. A case for gradation in prevention campaigns (early ages: abstinence, older groups: less use and quitting) would require more research.



- The evidence base for favouring family-based programmes over other approaches is weak, although where used with behavioural parent training, family-skills training and family therapy offer some benefits.

## Recent trends in universal prevention in Europe

### Standardised programmes

In terms of recent European trends at the universal prevention level, a general trend is the increased reliance on standardised programmes (EMCDDA, 2006a) and inclusion or prioritisation of alcohol and tobacco within general substance prevention (EMCDDA, 2006c). For example, the EU-Dap trial to develop and evaluate a European school prevention programme has reported encouraging results for cannabis, finding that its programme reduced occasional cannabis use by 23% and 24% respectively (EU-Dap, 2006). The programme, implemented in a considerable number of countries (Belgium, Germany, Greece, Spain, Italy, Austria and Sweden, now joined by Poland and the Czech Republic), involves 143 schools, 345 classes and 7 079 students. The early findings after one year need long-term validation during phase II of the project (begun in October 2006). Still, it is worthy of mention that the EU-Dap project has strong initial results while also straddling different prevention and drug consumption cultures.

### Gender focus

Gender aspects are increasingly being taken into account in prevention, although there is a trend in many countries in Europe for gender consumption patterns for cannabis to be eroded, notably in Ireland (EMCDDA, 2006a; Frisher et al., 2007). Male gender predicts more intense use (Butters, 2005), while a study suggests that girls are more responsive to parental disapproval and are more cautious in selection of their peers (Butters, 2004). For girls, the programmes that are most effective in sustaining positive effects on substance use prevention after their completion focus on behaviourally orientated life skills. In contrast, methods of delivery that involve interaction with peers or adults are particularly effective in boys (Springer et al., 2004). Competence enhancement approaches, for example, can target gender differences. For boys, a number of European projects (e.g. *Beer-Group* in Germany, *Risflecting* in Austria, *Bagmaendene* in Denmark) focus on the lack of flirting skills among boys which may be related to intensive use of alcohol or cannabis in order to feel able to approach girls. Nonetheless, across Member States, gender-specific programmes remain underdeveloped (EMCDDA, 2006b).

## Recreational settings

A number of prevention programmes have targeted cannabis in the context of other recreational settings. These include campaigns at music festivals, Dutch coffee shops and nightlife settings. As with general community prevention programmes, reports emphasise the importance of engaging various actors in the process (police, licensees, staff, organisers) (EMCDDA, 2006d; Reitox national reports).

## Risk perception and normative beliefs

Risk perception is a complex but important factor in prevention. Risk perception is not easy to modify with knowledge approaches alone. Own experiences, observation of others and common myths associated with cannabis modulate perception more than knowledge itself (Springer et al., 1996). Normative beliefs are particularly important as cannabis-using youth tend to extrapolate the level of use of their immediate peers to 'normality' and overestimate the prevalence of drug use (Page and Roland, 2004). This might also happen through drug-using peer selection. Recently, considerable symbolism or 'brand value' surrounding cannabis has emerged, which encourages acceptance. Cannabis is often associated with ideas such as ecology, alternative culture, non-conformism and left-wing attitudes. While some prevention programmes focus on deconstructing or neutralising such 'marketing' of cannabis, research is needed on their effectiveness. Some Member States have reported attempts to reverse the social perception of cannabis use as normative behaviour, that is to correct the misconception that the majority of adults and adolescents use drugs (EMCDDA, 2004; McGrath et al., 2006). The recent introduction in Europe of 'strong' public place smoking bans is also being monitored for any knock-on effects on cannabis, particularly with regards to adolescent smoking.

At the schools level, structural and regulatory policies — school rules — have an even higher impact than universal prevention programmes on preventing or delaying legal and illegal substance use (Hawks et al., 2002). Tobacco smoking is a good predictor for cannabis use and its escalation (Duncan et al., 1998, Vázquez and Becoña, 2000) and prior experiences with legal substances may be a significant risk factor for later illegal drug use (von Sydow et al., 2002). Consequently, some Member States encourage that schools have drug policies in place which define procedures and rules about use and availability of cannabis as well as dealing with legal and illegal substances in and around school premises. A number of countries have focused on guiding school drugs policy, and in particular approaches to 'problem students' and dealing with those found using drugs. These include the UK's *Drugs: guidance for schools* (DfES, 2004) and *School drug policy: a review process* (Blueprint, 2004), Ireland's *Guidelines for developing a school substance use policy* (Department of Education and Science, 2003), and France's *Prévention des conduites addictives: guide d'intervention en milieu*



## Cannabis prevention in the EU

scolaire (CNDP-MILDT, 2006). Some Member States have introduced drug testing in schools, although this practice is contested on ethical grounds (McKeganey, 2005) and because either no preventive effect has been demonstrated in the extant research literature (Council of Europe, 2005; Drug Education Forum, 2006) or the evidence base is insufficient (UK Home Office, 2007). Further research on the subject is part of the Pompidou Group's current work programme.

### Family approaches

The family has an influence on drug use, and pro-social family processes have a significant impact on children's peer association, decreasing involvement with antisocial peers, and a significant negative effect on substance use initiation (Oxford et al., 2000; Ferrer-Wreder et al., 2004). A recent review of risk factors found that parental discipline, family cohesion and parental monitoring are among the strongest (Fisher et al., 2007). Compared with alcohol, parents have more difficulties to talk and address cannabis use of their children openly and to negotiate disciplinary boundaries (Highet, 2005). There are not many examples of structured and evaluated family-based prevention approaches in Europe, although parenting programmes with positive evaluation based on US studies (Kumpfer et al., 2003) have been introduced in Spain, Norway and the United Kingdom. Prevention programmes (websites, books, workshops, helplines) aimed specifically at assisting parents with children's drug problems have long been part of the European prevention landscape. Publications dealing exclusively with adolescent cannabis use are rarer, although examples exist<sup>(15)</sup>.

### Mass media campaigns

Mass media campaigns have been a popular option in prevention and especially in cannabis prevention. Recent major cannabis campaigns include the UK's 2006 *Brain Warehouse* campaign, Spain's *Drogas: hay trenes que es mejor no coger* and France's *Cannabis et Conduite* campaign<sup>(16)</sup>, with a trend to use mass media within multi-component programmes (McGrath et al., 2002, updated 2006, citing Flay, 2000). Research — again, broadly drawn from non-European sources — suggests, however, that their effectiveness, and especially efficiency, is limited and largely depend on the objectives. They can have effects on attitudes and knowledge (Carroll et al., 2000), but rarely on behaviour (Derzon and Lipsey, 2002). The overall evidence for the impact of

<sup>(15)</sup> Examples include: in the USA, *Marijuana: facts parents need to know* (NIDA, 2004); in Switzerland, *Cannabis: mit Jugendlichen darüber sprechen* (SFA/ISPA, 2005); in France, *Cannabis: les risques expliqués aux parents* (MILDT, 2005) ([www.inpes.sante.fr/CFESBases/catalogue/pdf/806.pdf](http://www.inpes.sante.fr/CFESBases/catalogue/pdf/806.pdf)).

<sup>(16)</sup> The *Brain Warehouse* cannabis campaign ([www.brainwarehouse.tv](http://www.brainwarehouse.tv)) included a TV advertisement, scratchcards, leaflets and a dedicated website. The EUR2.2 million *Drogas: hay trenes...* campaign included a TV and radio spot and posters. The *Cannabis et conduite* ([www.cannabisetconduite.fr](http://www.cannabisetconduite.fr)) campaign included a website and radio campaign.





mass media campaigns on consumption patterns is not strong and has mainly focused on how many people were reached by campaign messages (Paglia and Room, 1999; Hall and Pacula, 2003). Isolated studies provide evidence that recall of anti-drug advertising was associated with a lower probability of cannabis and cocaine/crack use (Block et al., 2002) or have shown that mass media campaigns aimed at high sensation seekers may be effective (Stephenson, 2003). However, the large-scale evaluation of the US billion-dollar National Youth Anti-Drug Media Campaign showed no or even negative behavioural outcomes, suggesting a 'boomerang effect' whereby those exposed to the campaign were more likely to consume (EMCDDA, 2007).

## Selective prevention

Selective prevention is led by risk factor-specific research allowing for the identification of risk groups (see Coggans, this monograph) mostly by social and demographic variables. An understanding of risk factors associated with cannabis use and its adverse consequences has immediate benefits for the design, targeting and implementation of drug prevention (Kandel et al., 1978; Susser, 1987; Daugherty and Leukfeld, 1998).

Contrary to the traditional approach of secondary prevention, which targets those who already use drugs because they consume, more recent strategies acknowledge that cannabis consumption alone is not a useful predictor for the problems to be prevented (see Coggans, this monograph). The strength of selective prevention is that it is not guided by the idea that risk equals substance use, but by social and personal vulnerability factors for problematic drug use. If drug use alone is to be used as a criterion of the need for prevention, the danger is high that youths with transitory drug experimentation are wrongly classified and stigmatised as a high-risk group (Schmidt, 2001).

### Selective prevention in the school setting

The most convenient setting for selective prevention interventions targeting experimenting or vulnerable youth is while they are still attending school. There are, however, challenges in selectively addressing vulnerable adolescents when the mainstream prevention messages are health promotion and non-use and when teachers are (if at all) only trained in universal prevention methods but are not prepared to deal with 'difficult' or experimenting youngsters (Parker and Eggington, 2002).

The main subgroups at which selective prevention in schools is aimed are students with social behavioural problems such as anti-social behaviour (Tarter et al., 2002), academic underachievement (Lynskey and Hall, 2000), low bonding, infrequent school attendance, and impaired learning because of drug use (Hawkins et al., 1991, 1992;



Lloyd, 1998). Targets may also include pupils with high truancy or who have been excluded from school (Goulden and Sondhi, 2001; Powis and Griffiths, 2001), students with family problems (e.g. running away from home), immigrant students and those belonging to ethnic minorities <sup>(17)</sup>. Academic performance and school attendance are good predictors for drug problems, and monitoring these enables early and accurate intervention (EMCDDA, 2006a). Other strong patterns include early adolescent smoking and heavy drinking (Gil et al., 2002; de Vries et al., 2003; Orlando et al., 2005; Paddock, 2005), with tobacco having strong associations with later cannabis use (Duncan et al., 1998; Vázquez and Becoña Iglesias, 2000).

## Social vulnerability factors

Formerly, it was believed that elements from social influence and life skills programmes would not work well in selective prevention approaches (e.g. Tobler et al., 2000). However, several elements of such programmes are suggested as moderately effective for vulnerable youth (Sussman et al., 2004; Roe and Becker, 2005; McGrath et al., 2006). The associated contents — normative restructuring (e.g. learning that most peers and the opposite sex disapprove of use), assertiveness training, motivation and goal-setting, as well as myth correction — are still not included in the typical contents of European selective prevention intervention for cannabis. The focus is instead generally placed on knowledge approaches.

## Selective prevention within the criminal justice system

The association between cannabis use and crime or delinquency is well documented (Fergusson et al, 2002; Hall and Pacula, 2003). A study in Spain by the Centro de Estudios sobre Promoción de la Salud (CEPS, 2004) of a sample of youths at protection and reform centres found approximately one-third reported weekly cannabis use. A UK study of youth arrest referrals reported the following use of substances: cannabis (30%), tobacco (30%) and alcohol (23%), with other drugs much lower (cocaine, 4%, crack, 1%, heroin, 1%) (UK Home Office, 2007). Two Dutch studies (Vreugdenhil et al., 2003; Korf et al., 2005) also reported a high prevalence of cannabis use among youths in detention centres (see Netherlands national report, 2006). However, caution must be applied in that (i) there is consensus that there are associations, not causal links, between cannabis and offending; (ii) many studies embrace all types of drug use (illicit drugs, alcohol) not cannabis in isolation, with persistent offending associated with harder drugs (Flood-Page et al., 2000); (iii) 'crime' runs the gamut, from serious offences to delinquency and misbehaviour; and (iv) consumption is an offence *per se*.

<sup>(17)</sup> For an overview of screening instruments for assessing cannabis use, see Beck and Legleye, this monograph.







A recent study suggests that the gateway effect of 'soft' drug use for later progression into delinquency may be overplayed (Pudney, 2003). Moreover, studies have illustrated the importance of situational, social and peer influences in contrast to individual psychological problems in initiating drug use among young people (Rhodes et al., 2003; Butters, 2004).

While the ethics of coercion into compulsory treatment have been debated, the criminal justice system represents an important setting for selective prevention in the form of referrals. In most Member States, corresponding legal provisions exist for referral of prisoners and offenders. Young offenders (especially those first notified for drugs offences) are treated with particular consideration. Drug testing for adult and (less commonly) young arrestees has been introduced in some countries. However, specific guidelines are often missing and the cooperation and coordination between social (prevention) services and judicial services, although of key importance, are considered difficult (Newburn, 1999; UK Home Office, 2007). Selective prevention programmes in the criminal justice system (see Box 2 for examples) rely on the fact that cannabis use and possession are illegal, opening up a referral opportunity for targeted intervention for young people at risk. The evaluation of the Austrian project *Way Out* showed that it could be introduced successfully in schools and by public health officers as well as school doctors, although the main channel for referrals was the police. The evaluation found fewer personality deficits among youngsters first notified for cannabis offences than expected.

## Selective prevention in informal settings

A recurrent question is how to get in touch with those youngsters at risk of developing problematic consumption patterns but who are not reached at school or in other formal settings. There are many situations where it is only possible to approach adolescents in informal or recreational settings. Haas et al. (2001) point out that in Austria youngsters who experiment with drugs are frequently excluded from youth services, thereby increasing their social exclusion. As a result, occasions for selective and indicated prevention are missed. Attractive drop-in and counselling facilities with a judgement-free attitude is one strategy option. In some Member States, pro-active approaches — called 'interventionist tracking' — for vulnerable youth are applied, mostly through cooperation of different services (Green et al., 2001) and social actors (Arbex Sanchez et al., 2002).

Many strategies and projects focus on identifying, approaching and attracting vulnerable young people in order to intervene at an early stage of problem development and to provide counselling or referral to specialised services. Outreach work<sup>(18)</sup> traditionally reaches out to obviously problematic drug users and is less associated with approaching

<sup>(18)</sup> The EMCDDA's web page on outreach work is at [www.emcdda.europa.eu/?nnodeid=1576](http://www.emcdda.europa.eu/?nnodeid=1576)

Box 2: Selective prevention for cannabis/illicit drug use – examples from Exchange on Drug Demand Reduction Action (EDDRA)

The EMCDDA's EDDRA database offers information on a broad range of evaluated drug demand reduction actions in the EU Member States. Selection criteria for this small sample were outcome-evaluated interventions with a predominant focus on cannabis. None has a control group design and outcome variables are not necessarily drug use related.

Step by Step (Austria and Germany) is a computer program for early diagnosis of drug-related problems and for possible interventions at schools. It helps teachers who are confronted with problem pupils to find out whether or not these pupils use drugs.

[www.emcdda.europa.eu/html.cfm/index52035EN.html?project\\_id=5957&tab=overview](http://www.emcdda.europa.eu/html.cfm/index52035EN.html?project_id=5957&tab=overview)

FreD (Austria and Germany) is a programme that targets first-time offenders up to the age of 25 who have been arrested due to the consumption of illegal drugs. They are referred to a course which motivates them to change their drug use.

[www.emcdda.europa.eu/html.cfm/index52035EN.html?project\\_id=2091&tab=overview](http://www.emcdda.europa.eu/html.cfm/index52035EN.html?project_id=2091&tab=overview)

Way out (Austria) is an early intervention for young drug-using first offenders. Support is offered over a period of approximately 6 months with the aim of encouraging abstinence for illegal drugs, moderation for legal substances and avoidance of drug-related problems.

[www.emcdda.europa.eu/html.cfm/index52035EN.html?project\\_id=5038&tab=overview](http://www.emcdda.europa.eu/html.cfm/index52035EN.html?project_id=5038&tab=overview)

MSF — Solidarite Jeunes (Luxembourg) provides therapy to youths consuming drugs and to their families referred from judicial or educational systems.

[www.emcdda.europa.eu/html.cfm/index52035EN.html?project\\_id=3656&tab=overview](http://www.emcdda.europa.eu/html.cfm/index52035EN.html?project_id=3656&tab=overview)

Àmbits-Esport (Catalonia, Spain) provides a sport-based programme for immigrant youths from North Africa, sub-Saharan Africa and Latin America aimed at reducing smoking and illicit drug consumption (in particular, cannabis), together with integration with Catalan peers.

[www.emcdda.europa.eu/html.cfm/index52035EN.html?project\\_id=2918&tab=overview](http://www.emcdda.europa.eu/html.cfm/index52035EN.html?project_id=2918&tab=overview)



vulnerable youth and cannabis users who are not addicted. From some Member States, centres for mobile youth or street work are reported, which closely cooperate with relevant help organisations so that assistance may be provided at the earliest stage possible. Such measures and their relevance for vulnerable and experimenting youth are intensively discussed, for example in Austria, and are foreseen to attain an increasing geographical coverage (Haas et al., 2001, 2002).

## Indicated prevention

There are some conditions that have been identified as potentially increasing the risk for intense cannabis use, such as attention deficit disorder (ADD) (Giedd, 2003), and affect dysregulation (Simons and Carey, 2002) in the sense of emotional instability and impulsivity. Children and adolescents with ADD might seek to relieve their state of anxiety, tension and dysphoric mood and the sensation of 'noise' in the brain (due to the low synaptic dopamine availability in the essential brain areas) through 'self-treatment' with cannabis. However, systematic early detection, treatment and follow-up involving general health services and paediatricians are reported only from Germany, Italy and Sweden in their national reports. An increase in cannabis-related psychoses is reported from psychiatric services (see Witton, this monograph, volume 2), and according to recent reviews there is evidence that cannabis is a risk factor for schizophrenia (Arseneault et al., 2004; Smit et al., 2004). There seems to be a strong case to pay increased attention to reducing the intensity of consumption in order to respond to cannabis-related public health problems. Motivational interviewing, for instance, has shown to reduce the intensity of consumption without formal treatment (McCambridge and Strang, 2004), although there is evidence to suggest that short-term gains are not maintained at 1-year follow-up (McCambridge and Strang, 2004).

## Between prevention and treatment

While provision of drug treatment is often the most immediate reaction of policymakers to drug use, a strategy of expanding counselling or early intervention *offers* for cannabis users in cone structures may have difficulties in reaching the target population. These problems might be increased if the services for cannabis clients are offered in the same setting as for heroin users. There is a reluctance of cannabis users to consider themselves as drug users or as having a drug problem and to seek help and advice for themselves.

Member States are increasingly acknowledging this need to reach out to a wider vulnerable population. Approaches which are less treatment-focused stress the importance of literacy, academic capacities, employment, gender, social integration, body (self) perception, rationality, social networks, and the functionality of use (Boys



and Marsden, 2003). Some municipalities in Denmark have been successful in offering help to groups of young people with an emerging cannabis problem via day centres, where they gather in small groups (up to 10) and are supported by a therapist or social worker. They are offered space and time to talk about their life, problems and drug use. Supportive methods are favoured: offering help, for example, to plan for the future, to pursue their education or to get a job. Evaluation shows that the participants profit greatly from contact with adults who offer support, respect and who accept them on their own conditions. Results also suggest that the increasing but not yet full-blown drug problem 'solves itself' if help with other problems (school, family, friends) is offered (Danish national report, 2005). The specific support for integration into the educational system or the workplace has shown to be of great importance in preventing further social exclusion. Several Member States have similar projects. The German web-based counselling programme *Quit the Shit*<sup>(19)</sup> is another example of an innovative approach for cannabis users who want to reduce or stop using cannabis. It comprises a 50-day programme, based on cognitive-behavioural principles, including information and featuring a diary that is submitted to an intervention team for regular feedback. Those who made use of the online support to quit using cannabis had their average consumption quantity reduced by a third 3 months after the completion of the programme. The number of days on which cannabis was consumed went down by 50% (Die Drogenbeauftragte der Bundesregierung, 2005).

## Conclusions and challenges

Cannabis use prevalence is generally increasing among youth in the EU and the perception of its risks has generally decreased in recent years<sup>(20)</sup>. The large majority of European cannabis smokers have already smoked tobacco, and there is an association between a tolerant tobacco policy, smoking prevalence and cannabis consumption. This suggests that there is considerable scope of action for structural prevention, directed at attitudes and normative frameworks in respect to legal substances as well as cannabis. The effects of current public place smoking bans in Europe should be monitored to look specifically at knock-on effects on cannabis.

Cannabis use is mostly experimental, but compared with other illegal drugs, the number of regular and daily users is higher (EMCDDA, 2006a). About 9 out of 10 persons who have ever used cannabis began at around 14 and stopped before the age of 24. This implies that there is a 'vulnerability window' where prevention interventions should focus on preventing experimenters beginning to develop cannabis-related problems and where entering regular consumption patterns. Even if the majority will

<sup>(19)</sup> [www.drugcom.de/](http://www.drugcom.de/)

<sup>(20)</sup> See Hibell, this monograph.



never develop problematic use, the opportunity for selective and indicated prevention or early intervention to identify those at risk and to be able to assist them with targeted interventions is considerable. Appropriate offers of early intervention and support at the border between prevention and treatment might be more attractive to this group than traditional drug help facilities.

Even regular cannabis users rarely seek support, help or treatment on their own initiative. Counselling or early intervention services are not likely to be appropriate when there is no problem awareness among the users themselves. However, the illegal status of cannabis may sometimes be strategically helpful in the sense that cannabis users are being brought into contact with cannabis counselling or other interventions through contact with the criminal justice system for possession offences. Reports that very young people sometimes appear in treatment centres with advanced cannabis use patterns after only a short period of use indicates that some powerful personal and social risk factors can lead to rapid progression of cannabis-related problems. Supporting such children at an early stage is a challenge for indicated prevention.

The majority of available projects in the EU publicised through EDDRA do not have sufficient evaluation, which makes European intervention planning still largely dependent on US research and evaluation findings (Matthys et al., 2006). Consumption reduction is rarely assessed as an outcome, and the cost-effectiveness of programmes is difficult to calculate (Matthys et al., 2006). Moreover, while there has been a search for evidence-based universal intervention in the USA, the notion of what works is fraught with questions about the philosophy, objectives and measures of effectiveness (Cohen, 2001; Gorman, 2002; Ashton, 2003).

There is some cause for optimism: a recent Scottish literature review of school-based drug prevention programmes concluded that prevention, 'in general can be effective [and] that some types and features of drug education are more effective than others. In particular, drug education using highly interactive methods and social influences approaches, specifically including resistance skills and normative education elements, is consistently shown to be more effective' (Stead and Angus, 2007). Moreover, there is an increased understanding of common risk and protective factors and trajectories of drug use (e.g. Advisory Council on the Misuse of Drugs, 2006), and some of this has been translated into practical instruments and materials. A particularly prescriptive report is Australia's National Cannabis Strategy 2006–2009, albeit in a non-European context. Yet, there are also challenges to face. A Belgian study concludes that 'Researchers continue to come up against substantial methodological, practical and ethical problems if they want to put in place effectiveness evaluations relating to drug prevention' (Matthys et al., 2006).

## Bibliography

- Advisory Council on the Misuse of Drugs (2006), *Pathways to problems: hazardous use of tobacco, alcohol and other drugs by young people in the UK and its implications for policy*.
- Amengual, M. (2000), 'Enfoques preventivos del uso y abuso de cannabis y problemas asociados', in Bobes, J., Calafat, A. (eds), *Monografía Cannabis, Adicciones 12* (Suppl. 2): 281–299.
- Amos, A., Wiltshire, S., Bostock, Y., Haw, S., McNeill, A. (2003). "You can't go without a fag ... you need it for your hash" — a qualitative exploration of smoking, cannabis and young people', *Addiction* 99: 77–81.
- Arbex Sanchez, C., Mora Rodrigues, C., Moreno Arnedillo, G. (2002), *Guía de intervención: menores y consumos de drogas*, ADES, Madrid.
- Arseneault, L., Cannon, M., Witton, J., Murray, R. M. (2004), 'Causal association between cannabis and psychosis: examination of the evidence', *British Journal of Psychiatry* 184: 110–117.
- Ashton, M. (2003), 'The American STAR comes to England', *Drug and Alcohol Findings* 8: 21–26.
- ASPECT Consortium (2004), *Tobacco or health in the European Union*. Luxembourg: Office for Official Publications of the European Communities.
- Australian Ministerial Council on Drug Strategy (2006), *National cannabis strategy 2006–2009*, Commonwealth of Australia, Canberra.
- Bachman, J. G., Johnson, L. D., O'Malley, P. M. (1998), 'Explaining recent increases in students' marijuana use: impacts of perceived risks and disapproval, 1976 through 1996', *American Journal of Public Health* 88(6): 887–892.
- Block, L. G., Morwitz, V. G., Putsis, W. P. Jr, Sen, S. K. (2002), 'Assessing the impact of antidrug advertising on adolescent drug consumption: results from a behavioral economic model', *American Journal of Public Health* 92(8): 1346–1351.
- Blows, S., Ivers, R. Q., Connor, J., Ameratunga, S., Woodward, M., Norton, R. (2005), 'Marijuana use and car crash injury', *Addiction* 100: 605–611.
- Blueprint (2004), *School drug policy review process*, UK Home Office, London [www.wiredforhealth.gov.uk/PDF/school\\_drug\\_policy\\_review\\_04.pdf](http://www.wiredforhealth.gov.uk/PDF/school_drug_policy_review_04.pdf)
- Botvin, G. (2000), Preventing drug abuse in schools: social and competence enhancement approaches targeting individual-level etiologic factors. *Addictive Behaviours* 25(6): 887–897.
- Boys, A., Marsden, J. (2003), 'Perceived functions predict intensity of use and problems in young polysubstance users', *Addiction* 98: 951–963.
- Bühler, A., Kröger, C. (2006), *Expertise zur Prävention des Substanzmissbrauchs*. (Forschung und Praxis der Gesundheitsförderung Band 29), Bundeszentrale für gesundheitliche Aufklärung, Cologne.
- Bukowski, W. J., Sloboda, Z. (eds) (2003), *Handbook of drug abuse prevention theory and practice*, Plenum, New York.
- Burkhardt, G., Crusellas, L. (2002), *Comparison of school-based prevention programmes in Europe: an analysis of the EDDRA (exchange on drug demand reduction action) database*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- Buston, K., Wight, D., Hart, G., Scott, S. (2002), 'Implementation of a teacher-delivered sex education programme: obstacles and facilitating factors', *Health Education Research* 17(1): 59–72.
- Butters, J. E. (2004), 'The impact of peers and social disapproval on high-risk cannabis use: gender differences and implications for drug education', *Drugs: education, prevention and policy* 11(5): 381–390.
- Butters, J. E. (2005), 'Promoting healthy choices: the importance of differentiating between ordinary and high risk cannabis use among high-school students', *Substance Use and Misuse* 40: 845–855.
- Canning, U., Millward, L., Raj, T., Warm, D. (2004), *Drug use prevention among young people: a review of reviews*, Health Development Agency, London.

- Carroll, T., Lum, M., Taylor, J., Travia, J. (2000), *Evaluation of the launch phase of the national alcohol campaign*, Commonwealth Department of Health and Aged Care, Sydney.
- Caulkins, J. P., Pacula, R. L., Paddock, S. M., Chiesa, J. (2002), *School-based drug prevention — what kind of drug use does it prevent?*, RAND corporation.
- Caulkins, J. P., Pacula, R. L., Paddock, S. M., Chiesa, J. (2004), 'What we can — and cannot — expect from school-based drug prevention', *Drug and Alcohol Review* 23(1): 79–87.
- CEPS (2004), *Análisis de la situación de los centros de protección y reforma en el ámbito de la prevención*, Centro de Estudios de Promoción Social, Madrid.
- CNDP–MILDT (2006), *Prévention des conduites addictives: Guide d'intervention en milieu scolaire*, Mission interministérielle de lutte contre la drogue et la toxicomanie and Centre national de documentation pédagogique, Paris  
[www.drogues.gouv.fr/IMG/pdf/guide\\_intervention.pdf](http://www.drogues.gouv.fr/IMG/pdf/guide_intervention.pdf)
- Coggans, N., Cheyne, B., McKellar, S. (2003), *The Life Skills Training Drug Education Programme: a review of research*. University of Strathclyde, Glasgow, Scottish Executive Effective Interventions Unit, Scottish Executive Drug Misuse Research Programme.
- Cohen, J. (2001), *Drug education — how to be effective*, Healthwise, Liverpool.
- Council of Europe Pompidou Group (2005), *Draft recommendations for drugs testing*, Ethics Platform of the Pompidou Group  
[https://wcd.coe.int/ViewDoc.jsp?Ref=P-PG/Ethics\(2005\)7&Sector=secDG3](https://wcd.coe.int/ViewDoc.jsp?Ref=P-PG/Ethics(2005)7&Sector=secDG3)
- Cuijpers, P. (2002), 'Effective ingredients of school-based drug prevention programs: a systematic review', *Addictive Behaviors* 27: 1009–1023.
- Daugherty, R., Leukfeld, C. (1998), *Reducing the risks for substance abuse*, Plenum, London.
- Department of Education and Science (Ireland) (2003), *Guidelines for developing a school substance use policy*, Department of Education and Science, Dublin  
[www.drugsinfo.ie/SSUP.pdf](http://www.drugsinfo.ie/SSUP.pdf)
- Derzon, J. H., Lipsey, M. W. (2002), 'A meta-analysis of the effectiveness of mass-communication for changing substance-use knowledge, attitudes and behaviour', in Crano, W. D., Burgoon, M. (eds), *Mass media and drug prevention: classic and contemporary theories and research*, Lawrence Erlbaum Associates, Mahwah, New Jersey: 231–258.
- Die Drogenbeauftragte der Bundesregierung (2005), *Drogen- und Suchtbericht*. Bundesministerium für Gesundheit und soziale Sicherung, Berlin/Bonn.
- Dillon, D., Grewal, I., Chivite-Matthews, N., Brown, R., Weddell, E., Smith, N. (2006), *Risk, protective factors and resilience to drug use: identifying resilient young people and learning from their experiences*, Home Office, London.
- DfES (2004), *Drugs: guidance for schools*, Department for Education and Skills, London  
[www.teachernet.gov.uk/wholeschool/behaviour/drugs](http://www.teachernet.gov.uk/wholeschool/behaviour/drugs)
- Drug Education Forum (2006), *Random drug testing in English schools: public policy briefing*, London.
- Drugscope (2005), *Cannabis: A briefing paper for drug education practitioners*, London.
- Drugscope (2006), *Drug and alcohol education through theatre: guidance for schools and commissioners*, London.
- DrugInfo Clearinghouse (2005), *Prevention reading and resource list: Cannabis*, Melbourne.
- Duncan, S. C., Duncan, T. E., Hops, H. (1998), 'Progressions of alcohol, cigarette and marijuana use in adolescence', *Journal of Behavioural Medicine* 21: 375–388.
- Dusenbury, L., Brannigan, R., Falco, M., Hansen, W. B. (2003), 'A review of research on fidelity of implementation: implications for drug abuse prevention in school settings', *Health Education Research. Theory and Practice* 18(2): 237–256.
- Ellickson, P. L., McCaffrey, D. F., Ghosh-Dastidar, B., Longshore, D. L. (2003), 'New inroads in preventing adolescent drug use: results from a large-scale trial of Project ALERT in middleschools', *American Journal of Public Health* 93(11): 1830–1836.

- EMCDDA (1997), *Evaluating drug prevention in the European Union, Scientific Monograph Series 1*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2004), *Annual report 2004: the state of the drugs problem in the European Union and Norway*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2005), *Reitox national reports*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2006a), *Annual report 2006: the state of the drugs problem in the European Union and Norway*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2006b), *Annual report 2006 selected issue: a gender perspective on drug use and responding to drug problems*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2006c), *Annual report 2006 selected issue: European drug policies — extended beyond illicit drugs?*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2006d), *Annual report 2006 selected issue: developments in drug use within recreational settings?*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2007), *Prevention and evaluation resources kit – PERK*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EU-Dap Project (2005), *Technical report*.
- EU-Dap Project (2006), *Unplugged intervention manual* ([www.eudap.net](http://www.eudap.net)).
- EUROSTAT (2002), *Health statistics. Key data on health 2002*, Office for Official Publications of the European Communities, Luxembourg.
- Eveyard, P., Sherratt, E., Almond, J., et al. (2001), 'The change-in-stage and updated smoking status results from a cluster randomised trial of smoking prevention and cessation using the transtheoretical model among British adolescents', *Preventive Medicine* 33: 313–324.
- Faggiano, F., Vigna-Taglianti, F. D., Versino, E., Zambon, A., Borraccino, A., Lemma, P. (2005), School-based prevention for illicit drugs use. The Cochrane Database of Systematic Reviews 2005, Issue 2. Art. No.: CD003020.pub2. DOI: 10.1002/14651858.CD003020.pub2.
- Fergusson, D. M., Horwood, L. J., Northstone, K. (2002), 'Cannabis use and psychosocial adjustment in adolescence and young adulthood', *Addiction* 97: 1123–1135.
- Ferrer-Wreder, L., Stattin, H., Cass Lorente, C., Tubman, J. G., Adamson, L. (2004), *Successful prevention and youth development programs: across borders*, Plenum, New York.
- Flay, B. (2000), 'Approaches to substance use prevention utilizing school curriculum plus social environment change', *Addictive Behaviours* 25: 861–866.
- Flood-Page, C., Campbell, S., Harrington, V., Miller, J. (2000), *Youth crime: findings from the 1998/99 Youth Lifestyles Survey, Home Office Research Study 209*, Home Office Research and Statistics Directorate, London.
- Frisher, M., Crome, I., Macleod, J., Bloor, R., Hickman, M. (2007), Predictive factors for illicit drug use among young people: a literature review, UK Home Office Online Report 05/07.
- Gerstein, D. R., Green, L. W. (eds) (1993), *Preventing drug abuse: what do we know?*, National Academy Press, Washington.
- Giedd, J. (2003), 'ADHD and substance abuse', *Medscape Psychiatry and Mental Health* 8(1): [www.medscape.com/viewarticle/456199](http://www.medscape.com/viewarticle/456199)
- Gil, A., Vega, W., Turner, R. (2002), 'Early and mid-adolescence risk factors for later substance abuse by African Americans and European Americans', *Public Health Reports* 117 (Suppl1): S1–S29.
- Gordon, R. (1987), 'An operational classification of disease prevention', in Steinberg, J. A., Silverman, M. M. (eds), *Preventing mental disorders*, US Department of Health and Human Services, Rockville, MD.
- Gorman, D. M. (2002), 'The "science" of drug and alcohol prevention: the case of the randomized trial of the Life Skills Training programme', *International Journal of Drug Policy* 13: 21–26.
- Gottfredson, D. C., Wilson, D. B. (2003), 'Characteristics of effective school-based substance abuse prevention', *Prevention Science* 4(1): 27–38.



- Goulden, C., Sondhi, A. (2001), *At the margins: drug use by vulnerable young people in the 1998/99 Youth Lifestyles Survey. Home Office Research Study 228*. Home Office Research and Statistics Directorate, London.
- Green, A. E., Maguire, M., Canny, A. (2001), *Keeping track: mapping and tracking vulnerable young people*, Joseph Rowntree Foundation, The Policy Press, York.
- Haas, S., Vorderwinkle, C., Weigl, M. (2001), *Drogenspezifische Problemlagen und Präventionserfordernisse bei Jugendlichen*, Österreichisches Bundesinstitut für Gesundheitswesen, Wien: 1–29.
- Haas, S., Horvath, L., Weigl, M. (2002), 'Die Rolle der außerschulischen Jugendarbeit', in *Hinblick auf suchtgefährdete Jugendliche*, Österreichisches Bundesinstitut für Gesundheitswesen, Wien, 1–34.
- Hall, W., Pacula, R. (2003), *Cannabis use and dependence: policy health and the public policy*, Cambridge University Press, Cambridge.
- Hawkins, J. D., Lishner, D. M., Catalano, R. F. (1991), *Childhood predictors and the prevention of adolescent substance abuse, NIDA Research Monograph, Number 56*: 75–125.
- Hawkins, J. D., Catalano, R. F., Miller, J. Y. (1992), 'Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention', *Psychological Bulletin* 112(1): 64–105.
- Hawkins, J. D., Catalano, R. F., Brewer, D. D. (1995), 'Preventing serious, violent and chronic juvenile offending: effective strategies from conception to age six' in *Guide for implementing the comprehensive strategy for serious, violent and chronic juvenile offenders*, US Department of Justice, Washington DC.
- Hawks, D., Scott, K., McBride, N., Jones, P., Stockwell, T. (2002), *Prevention of psychoactive substance use. A selected review of what works in the area of prevention*, World Health Organisation, Geneva.
- Henquet, C., Krabbendam, L., Spauwen, J., Kaplan, C., Lieb, R., Wittchen, H. U., Van Os, J. (2004), 'Prospective cohort study of cannabis use, predisposition for psychosis, and psychotic symptoms in young people', *British Medical Journal* 330(11) [www.bmj.com/cgi/content/full/330/7481/11](http://www.bmj.com/cgi/content/full/330/7481/11)
- Hibell, B., Andersson, B., Bjarnason, T., Ahlström, S., Balakireva, O., Kokkevi, A., Morgan, M. (2003), *The ESPAD report 2003 — alcohol and other drug use among students in 35 European countries*, The Swedish Council for Information on Alcohol and Other Drugs, Stockholm, Sweden.
- Hight, G. (2005), 'Alcohol and cannabis: young people talking about how parents respond to their use of these two drugs', *Drugs: education, prevention and policy* 12(2): 113–124.
- Hurry, J., McGurk, H. (1997), 'An evaluation of a primary prevention programme for schools', *Addiction Research* 5: 23–38.
- Ives, R., Ghelanie, P. (2003), 'Poly-drug use — the use of drugs in combination', Pompidou Group discussion paper, Strasbourg.
- Jones, M. (2004), 'Anxiety and containment in the risk society: theorising young people and drug prevention policy', *International Journal of Drug Policy* 15: 367–376.
- Kandel, D. (ed.) (1978), *Longitudinal research on drug use: empirical findings and methodological issues*, Hemisphere, Washington.
- Kimberlee, R., Powell, J., Jones, M. (2003), 'Not asking and not counting: assessing need for young people's drug services', *Youth and Policy* 79, May/June 2003.
- Korf, D. J., Benschop, A., Rots, G. (2005), 'Geweld, alcohol en drugs bij jeugdige gedetineerden en school drop-outs', *Tijdschrift voor Criminologie* 47(3): 239–254.
- Krüger, C., Winter, H., Shaw, R. (1998), *Guidelines for the evaluation of drug prevention intervention: a manual for programme planners and evaluators*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- Kumpfer, K. L., Baxley, G. B. (1997), *Drug abuse prevention: what works?*, National Institute on Drug Abuse, Rockville, MD.

- Kumpfer, K. L., Alvarado, R., Whiteside, H. O. (2003), Family-based interventions for substance use and misuse prevention. *Substance Use and Misuse* 38(11–13): 1759–1787.
- Lloyd, C. (1998), 'Risk factor for problem drug use: identifying vulnerable groups', *Drugs: Education, Prevention and Policy* 5(3): 217–232.
- Lloyd, C., Joyce, R., Hurry, J., Ashton, M. (2000), 'The effectiveness of primary school drug education', *Drugs: Education, Prevention and Policy* 7(2): 109–126.
- Loxley, W., Toumbourou, J. W., Stockwell, T., Haines, B., Scott, K., Godfrey, C., Waters, E., Patton, G., Fordham, R., Gray, D., Marshall, J., Ryder, D., Siggers, S., Sanci, L., Williams, J. (2004), *The prevention of substance use, risk and harm in Australia*, National Drug Research Institute and Centre for Adolescent Health, Canberra.
- Lynskey, M., Hall, W. (2000), 'The effects of adolescent cannabis use on educational attainment: a review', *Addiction* 95: 1621–1630.
- McCambridge, J., Strang, J. (2004), 'The efficacy of single-session motivational interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: results from a multi-site cluster randomized trial', *Addiction* 99: 39–52.
- McCrystal, P., Thornton, M. (2004), *Drug and alcohol knowledge and use amongst primary school children: empirical evidence and methodological issues in the development of instruments for measuring use of and attitudes to drugs and alcohol in primary school children*, Institute of Child Care Research Queen's University Belfast, DHSSPSNI, Belfast.
- McGrath, Y., Sumnall, H., McVeigh, J., Bellis, M. (2002, updated 2006), *Drug use prevention among young people: a review of reviews*, Evidence briefing update, January 2006, UK Home Office, London.
- McKeganey, N. (2005), *Random drug testing of schoolchildren: a shot in the arm or a shot in the foot for drug prevention*, Rowntree Foundation, York.
- McKeganey, N., McIntosh, J., MacDonald, F., Gilvarry, E., McHardle, P., McCarthy, S., Hill, M. (2003), *Preteens and illegal drugs: use, offers exposure and prevention*, UK Department of Health, London.
- Manski, C. F., Pepper, J. V., Petrei, C. V. (eds) (2001), *Informing America's policy on illegal drugs: what we don't know keeps hurting us*, National Academy Press, Washington.
- Matthys, N., Van Hal, G., Beutels, P. (2006), 'Evidence based cannabispreventie in Vlaanderen, Onderzoek uitgevoerd' in opdracht van Inge Vervotte, Vlaams minister van Welzijn, Volksgezondheid en Gezin, Brussels  
[www.vad.be/toondocument.aspx?ref=13921](http://www.vad.be/toondocument.aspx?ref=13921)
- Merino, P. P. (2000), 'Vieja historia del cannabis y recientes prácticas preventivas en Europa', in Bobes, J., Calafat, A. (eds) (2000), *Monografía Cannabis*, Adicciones 12(Suppl. 2): 281–299.
- Milford, R., Lenton, S., Hancock, L. (2000), *A critical review and analysis: cannabis education in schools*, New South Wales Department of Education and Training, Student Service and Equity Programs, Australia.
- Miller, T., Hendrie, D. (2005), 'How should governments spend the drug prevention dollar? A buyer's guide', in Stockwell, T., Gruenewald, P. J., Toumbourou, J. W., Loxley, W. (eds), *Preventing harmful substance use: the evidence base for policy and practice*, John Wiley and Sons, Chichester: 416–431.
- Mrazek, P. J., Haggerty, R. J. (eds) (1994), *Reducing risks for mental disorders: frontiers for prevention intervention research*, National Academy Press, Washington DC.
- Nacro (2004), *Youth crime briefing drug testing and treatment for children and young people in the youth justice system*, London.
- Newburn, T. (1999), 'Drug prevention and youth justice', *British Journal of Criminology* 39(4): 609–624.
- NIDA (2003), *Preventing drug use among children and adolescents: a research-based guide*, National Institute on Drug Abuse, Bethesda.

- Orlando, M., Tucker, J. S., Ellickson, P. L., Klein, D. J. (2005), 'Concurrent use of alcohol and cigarettes from adolescence to young adulthood: an examination of developmental trajectories and outcomes', *Substance Use and Misuse* 40: 1051–1069.
- Oxford, M. L., Harachi, T. W., Catalano, R. F., Abbott, R. D. (2000), 'Preadolescent predictors of substance initiation: a test of both the direct and mediated effect of family social control factors on deviant peer associations and substance initiation', *American Journal of Drug and Alcohol Abuse* 27(4): 599–616.
- Paddock, S. (2005), 'School-based drug prevention and other strategies for reducing drug use', *Testimony presented to the Oregon State Senate and House Judiciary Committees on March 17, 2005*, RAND Corporation, Santa Monica ([http://www.rand.org/pubs/testimonies/2005/RAND\\_CT237.pdf](http://www.rand.org/pubs/testimonies/2005/RAND_CT237.pdf)).
- Page, R. M., Roland, M. (2004), 'Misperceptions of the prevalence of marijuana use among college students: athletes and non-athletes', *Journal of Child and Adolescent Substance Abuse* 14: 61–75.
- Paglia, A., Room, R. (1999), 'Preventing substance use problems among youth: a literature review and recommendations', *Journal of Primary Prevention* 20(1): 3–50.
- Parker, H., Egginton, R. (2002), 'Adolescent recreational alcohol and drugs careers gone wrong: developing a strategy for reducing risk and harms', *International Journal of Drug Policy* 13: 419–432.
- Plant, E., Plant, M. (1999), 'Primary prevention for young children: a comment on the UK government's 10 year drug strategy', *International Journal of Drug Policy* 10: 385–401.
- Powell, J., Jones, M., Kimberlee, R. (2003), 'Commissioning drug services for vulnerable young people', *Drugs: education, prevention & policy* 10(3): 251–262.
- Powis, B., Griffiths, P. (2001), *Working at the margins: an evaluation of a drugs-prevention programme for young people who have been excluded from school*, DPAS Briefing Paper 15, Home Office, London.
- Pudney, S. (2003), 'The road to ruin? Sequences of initiation to drugs and crime in Britain', *Economic Journal* 113(486): C182–C198(1).
- Rhodes, T., Lilly, R., Fernández, C., Giorgino, E., Kemmesis, U. E., Ossebaard, H. C., Lalam, N., Faasen, I., Spannow, K. E. (2003), 'Risk factors associated with drug use: the importance of "risk environment"', *Drugs: Education, Prevention and Policy* 10(4): 303–329.
- Roe, E., Becker, J. (2005), 'Drug prevention with vulnerable young people: a review', *Drugs: Education, Prevention and Policy* 12(2): 85–99.
- Schmidt, B. (2001), *Suchtprävention bei konsumierenden Jugendlichen: suchtpräventive Ansätze in der geschlechtsbezogenen Drogenarbeit*, Juventa Verlag Weinheim und München.
- Shepard, J., Carlson, J. S. (2003), 'An empirical evaluation of school-based prevention programs that involve parents', *Psychology in the Schools* 40(6): 641–656.
- Simons, J. S., Carey, K. B. (2002), 'Risk and vulnerability for Marijuana use problems: the role of affect dysregulation', *Psychology of Addictive Behaviours* 16: 72–75.
- Skara, S., Sussman, S. (2003), 'A review of 25 long-term adolescent tobacco and other drug use prevention programme evaluations', *Preventive Medicine* 37: 451–474.
- Smit, F., Bolier, L., Cuijpers, P. (2004), 'Cannabis use and the risk of later schizophrenia: a review', *Addiction* 99(4): 425–430.
- Smyth, N. J., Saulnier, C. F. (1996), 'Substance abuse prevention among high risk youth', *Journal of Prevention and Intervention in the Community* 14: 61–79.
- Soole, D. W., Mazerolle, L., Rombouts, S. (2005), *Monograph No. 07: School based drug prevention: a systematic review of the effectiveness on illicit drug use*, DPMP monograph series, Fitzroy: Turning Point Alcohol and Drug Centre.

- Springer, A., Uhl, A., Widensky, K., Sambrano, S., Kasim, R., Nistler, M. (1996), 'Schüler und Drogen in Österreich: Wissen, Erfahrungen, Einstellungen', *Wiener Zeitschrift für Suchtforschung* 19: 3–21.
- Springer, J. F., Sale, E., Hermann, J. (2004), 'Characteristics of effective substance abuse prevention programs for high-risk youth', *Journal of Primary Prevention* 25: 171–219.
- Stead, M., Angus, K. (2007), *Literature review into the effectiveness of school drug education*, Scottish Executive Education Department.
- van der Stel, J. (ed.) (1998), *European handbook on prevention: alcohol, drugs and tobacco*, Pompidou Group, Council of Europe and Jellinek Consultancy, Strasbourg.
- Stephenson, M. T. (2003), 'Mass media strategies targeting high sensation seekers: what works and why', *American Journal of Health Behavior* 27(Suppl 3): 233–238.
- Stockwell, T., Gruenewald, P. J., Toumbourou, J. W., Loxley, W. (2005), 'Recommendations for new directions in the prevention of risky substance use and related harms', in Stockwell, T., Gruenewald, P. J., Toumbourou, J. W., Loxley, W. (eds), *Preventing harmful substance use: the evidence base for policy and practice*, John Wiley and Sons, Chichester, 443–464.
- Susser, M. (1987), *Epidemiology, health and society. Selected papers*, Oxford University Press, New York.
- Sussman, S., Earlywine, M., Wills, T., Cody, C., Biglan, T., Dent, C. W., Newcomb, M. D. (2004), 'The motivation, skills and decision-making model of "drug abuse" prevention', *Substance Use and Misuse* 39(10–12): 1971–2016.
- von Sydow, K., Lieb, R., Pfister, H., Hofler, M., Wittchen, H. U. (2002), 'What predicts incident use of cannabis and progression to abuse and dependence? A 4-year prospective examination of risk factors in a community sample of adolescents and young adults', *Drug and Alcohol Dependency* 68(1): 49–64.
- Tammi, T., Peltoniemi, T. (eds) (1999), *Telematic drug and alcohol prevention: guidelines and experiences from Prevnet Euro*, European Commission and A-Clinic Foundation, Helsinki.
- Tarter, R. E., Kirisci, L., Vanyukov, M., Cornelius, J., Pajer, K., Shoal, G., Giancola, P. (2002), 'Predicting adolescent violence: impact of family history, substance use, psychiatric history, and social adjustment', *American Journal of Psychiatry* 159(9): 1541–1547.
- Thomas, R., Pereira, R. (2006), 'School-based programmes for preventing smoking', *The Cochrane Database of Systematic Reviews* 2006, Issue 3.
- Tobler, N. S., Roona, M. R., Ochshorn, P., Marshall, D., Streke, A., Stackpole, K. (2000), 'School-based adolescent prevention programs: 1998 meta-analysis', *The Journal of Primary Prevention* 20(4): 275–336.
- Tucker, J. (2001), 'Understanding multiple substance misuse: an alternative view from behavioural economics', *Addiction* 776–777.
- Tucker, J. S., Ellickson, P. L., Klein, D. J. (2002), 'Five-year prospective study of risk factors for daily smoking in adolescence among early nonsmokers and experimenters', *Journal of Applied Social Psychology* 32(8): 1588–1603.
- UK Home Office (2007), *Evaluation of drug interventions: programme pilots for children and young people: arrest referral, drug testing and drug treatment and testing requirements*, Matrix Research and Consultancy and Institute for Criminal Policy Research, Kings College, London.
- UNODC (2002), *A participatory handbook for youth drug abuse prevention programmes: a guide for development and improvement*, United Nations Office on Drugs and Crime, Vienna.
- UNODC (2006), *Monitoring and evaluating youth substance abuse prevention programmes*, United Nations Office on Drugs and Crime, Vienna  
[www.unodc.org/pdf/youthnet/action/planning/m&e\\_E.pdf](http://www.unodc.org/pdf/youthnet/action/planning/m&e_E.pdf)
- Vázquez, F., Becoña Iglesias, E. (2000), 'Factores de riesgo y escalada cannabinoide', in Bobes, J., Calafat, A. (eds), *Monografía Cannabis, Adicciones Vol. 12, Suplemento 2*, 175–184.



- Vreugdenhil, C., van den Brink, W., Wouters, L. F., Doreleijers, T. A. (2003), 'Substance use, substance use disorders, and comorbidity patterns in a representative sample of incarcerated male Dutch adolescents', *Journal of Nervous and Mental Disease* 191(6): 372–378.
- de Vries, H., Mudde, A., Kremers, S., Wetzels, J., Uiters, E., Ariza, C., Vitoària, P. D., Fielder, A., Holm, K., Janssen, K., Lehtovuori, R., Candel, M. (2003), 'The European Smoking Prevention Framework Approach (ESFA): short-term effects' *Health Education Research* 18: 649–663.
- Webster-Stratton, C., Taylor, T. (2001), 'Nipping early risk factors in the bud: preventing substance abuse, delinquency, and violence in adolescence through interventions targeted at young children (0–8 years)', *Prevention Science* 2(3): 165–192.
- World Health Organisation (2000), *Primary prevention of substance abuse: a workbook for project operators*.





## Chapter 12

# Moving towards evidence-based practice: school-based prevention of substance use in the USA

**Keywords:** cannabis – prevention – schools – USA

### Setting the context

As mentioned in the previous chapter, a significant amount of what we know about drugs prevention is based on research from the USA. This chapter — written by the former Director of the Division of Epidemiology and Prevention Research of the National Institute on Drug Abuse (NIDA) — provides a useful overview of recent experiences in school-based prevention in the USA, together with a presentation of a number of more prescriptive studies of ‘what works’ in the US context.

One of the questions that may arise from this chapter is the transferability of the US experiences within the European — or universal — context. We have seen in the first chapter of this volume (Vicente et al.) that the USA not only has relatively high cannabis prevalence in comparison with European countries. On a generational level, use of the drug became more widespread around 10 to 20 years earlier than in the majority of Western European countries.

To a considerable extent, we have also seen throughout this monograph that there remains the issue of diversity within Europe as regards cannabis and other drugs. A Europe approaching 500 million citizens is far from a monolithic society from most perspectives — economic, political, linguistic, sociocultural. European drug use patterns remain similarly heterogeneous. While there may be some approximation of US levels of cannabis prevalence among young adults in high-prevalence countries in Europe — such as the United Kingdom, Spain and Italy — many European countries report extremely low levels of cannabis use. Differences persist even among neighbours in Europe: one need only compare reported last month prevalence among 15- to 24-year-olds in the Czech Republic (15.4%) and Slovakia (3.9%), Spain (18.6%) and Portugal (5.5%), Denmark (8.2%) and Sweden (1.6%). If prevention is to be tailored to the needs



of a schools population, and given priority over other items within a school curriculum, it should reflect the likelihood of students to both experiment and progress to more intensive use of drugs.

Universalism should not, however, be dismissed. The promising early experiences of some transnational prevention projects across very different drug-using countries and cultures — such as EU-Dap — suggest that good practice can cross borders successfully. There are several early intervention initiatives — such as the *HIT* and Jellinek *knowcannabis* self-help site — that have resulted from international cooperation. Moreover, as we have seen, European knowledge of prevention practice is subjected to increasing study, data collection and cooperation. While, historically, prevention knowledge has benefited from much borrowing from the US literature, increasingly there is scope for transatlantic dialogue, with European studies contributing new experiences and ideas to the debate.

## Further reading

EMCDDA, *Annual reports*, published each year in November.

### Journals

*Drugs: Education, Prevention and Policy*  
*Journal of Alcohol and Drug Education*

### Websites

NIDA website on preventing drug abuse among children and adolescents

[www.nida.nih.gov/Prevention/Prevopen.html](http://www.nida.nih.gov/Prevention/Prevopen.html)

EELDA website on School-based drug prevention

<http://en.eelda.org/index.aspx?o=1076>

See also the grey literature list in the Appendix to Volume 1 of this monograph.





# Moving towards evidence-based practice: school-based prevention of substance use in the USA

Zili Sloboda

## Introduction

Prior to the 1970s there was little knowledge on which to base the development of prevention programming in the USA (Sloboda, 2003). As is the case today in much of Europe, efforts in schools to prevent or delay initiation of smoking, alcohol or drug use lacked any research basis. However, the creation of the National Institute on Drug Abuse (NIDA) in 1974 began a period of important research that served to move prevention from an art to a science (Bukoski, 2003). Longitudinal cohort studies that followed children and adolescents over time and national surveys that were administered at regular intervals were funded. These research efforts not only gave more accurate assessments of trends in substance use in the country but also specification of those biological, individual, family, school, peer and community factors that increased the susceptibility of some children and adolescents to the use of alcohol, tobacco, marijuana and other drugs (Kandel, 1975; Hawkins et al., 1992). In addition, the longitudinal cohort studies (e.g. Kandel, 1975; Newcomb and Bentler, 1986) showed a progression from 'legal' substances (tobacco and alcohol) to illicit drugs (marijuana and cocaine) (Kandel, 1988; Kandel and Yamaguchi, 1999). These epidemiological findings greatly influenced prevention programme developers and researchers. The vast predominance of substance abuse prevention programmes that were evaluated and found effective grew from the research on the initiation of use. As such, these programmes target all children and adolescents no matter their level of susceptibility and specifically address the use of tobacco and alcohol, as well as marijuana and other illicit drugs (to include inhalants).

Furthermore, as the research also indicated that the initiation of most substance use among adolescents takes place through peer influence, prevention researchers based their programmes on social learning incorporating the concept of self-efficacy (Bandura, 1977). These programmes are centred around social resistance skills training (Botvin and Griffin, 2003) as they increase students' resistance to those influences that encourage substance use and they focus on providing students with the skills they need to resist offers to use alcohol, tobacco or illicit drugs and to practise these



resistance skills in 'virtual' situations that are realistic to them. Most of these universal <sup>(1)</sup> programmes are delivered in schools as curricula. Other prevention programmes address the needs of more vulnerable children and adolescents and their families through counselling or more in-depth therapies.

## Evidence-based school-based prevention programming

Meta-analyses and reviews of evaluation studies of prevention programmes had been conducted in the late 1980s and throughout the 1990s to identify the determinants of effectiveness. These analyses and reviews, however, were very much restricted by what reports were available at the time. For instance, Schaps and his colleagues (1981), Bangert-Drowns (1988) and Brunvold and Rundell (1988) found in their analyses that prevention programmes of the late 1970s and early 1980s were effective in providing knowledge to participants but impacting attitudes and drug-using behaviours were more difficult to address and that the use of peer facilitators, use of interactive instructional style and high 'doses' of exposure to prevention programming led to better outcomes.

Tobler's work, summarised in her 2000 article, 'Lessons learned', used meta-analytic approaches using data from studies of 207 school-based drug prevention programs with drug use measures that were reported in the literature (1992, 1997 and 2000). Each review had subsequently better data, reflecting improvements in measurements and in the quality of data collection efforts. Her analyses looked at content, delivery method, and programme size. Her findings indicate what works and what doesn't work. As can be seen in Table 1, programmes with content that covers both short- and long-term consequences of substance use, address misconceptions regarding the normative nature of adolescent substance use, and provide opportunities to learn and practice decision making/problem solving, assertiveness and resistance skills had larger effect sizes. In addition, delivery or instructional style was found to be important. Adolescents learn best when they are actively involved through small group discussions, role play, and given sufficient time to practise their new skills. These elements were also found by Tobler and her colleagues to be important specifically for the prevention of marijuana use (Tobler et al., 1999). Other reviewers of prevention programmes have had similar findings even when using other analytical techniques (e.g. Brunvold, 1993; Harachi et al., 1999; Cuijpers, 2002; Nation et al., 2003). Elements added through these reviews included having a theoretical framework and addressing commitment or intentions not to use.

(1) In 1994, the mental health and substance abuse fields adopted a classification system for prevention programming depending on the level of risk of the targeted group. Universal programmes address general populations while selective programmes target those segments of the population that present greater than normal risk to develop a disorder and indicated programmes focus on those subgroups that exhibit signs or symptoms of developing a disorder.



Table 1: Tobler (2000) findings of what works and what doesn't work

Works	Doesn't work
<p><b>Content</b></p> <p>Short-term effects</p> <p>Long-term health consequences</p> <p>Feedback on peer use from school surveys</p> <p>Addressing media and social influences that promote pro-drug attitudes and behaviours</p> <p>Adjustment of perceptions regarding peer substance use</p> <p>Provide/practise drug refusal skills, assertiveness skills, communication skills, safety skills, coping skills, goal-setting, decision-making/problem-solving skills</p> <p><b>Delivery</b></p> <p>Active involvement of everyone in class</p> <p>Active participation <i>between</i> peers</p> <p>Role plays around scenarios generated by students</p> <p>Developmentally appropriate activities to promote bonding</p> <p>Eliciting positive/supportive comments from peers</p> <p>Rehearsal of resistance/refusal skills with modelling of appropriate behaviours</p> <p>Lots of practice time</p>	<p><b>Content</b></p> <p>Not including short-term consequences</p> <p>Not addressing perceptions of peer substance use</p> <p>Not addressing media and social influences</p> <p>Allowing values or moral and ethical decision-making</p> <p>Not developing interpersonal skills or drug refusal skills</p> <p>Focusing primarily on intrapersonal aspects</p> <p>Focusing only on self-esteem building</p> <p><b>Delivery</b></p> <p>Allowing passive participation on the parts of the students</p> <p>Teacher-centred discussions and lecturing solely</p> <p>Dialogues without structure</p> <p>Use of effective classroom management techniques without a drug programme</p>

In another review of school-based prevention programmes conducted under the Cochrane Collaboration, only evaluations using randomised controlled trials (RCTs) or controlled prospective studies (CPSs) were reviewed. Of the 32 selected for review, 28 were from the USA. Most of the studies used post-test or intervention assessments and focused on students in the sixth and seventh grades, i.e. around 12–14 years of age. Separate reviews were made for RCT ( $n = 29$ ) and CPS ( $n = 3$ ) evaluations. No significant results were found among the CPS while the RCT programmes that offered skills training had the best outcomes (Faggiano et al., 2005).

The movement from examining the elements or principles of prevention to a focus on programmes and practices began when NIDA sponsored the first conference on drug abuse prevention in 1996 (Putting Research to Work for the Community). The goal of



the conference was to introduce the findings from prevention research in a user-friendly style to practitioners. The outcome of the conference was a booklet, *Preventing drug use among children and adolescents: a research-based guide* (Sloboda and David, 1997) written in a question–answer format that presented how research findings could be used to plan and develop prevention programming and practices for the community. The approach taken was to present ‘principles’ of prevention related to content, structure and delivery. The result was a list of 13 underlying principles drawn from commonalities found in both epidemiological and prevention research (an updated version of these principles is presented in Table 2).

In addition, however, the booklet summarised the findings from evaluations of prevention interventions funded through NIDA that had significant outcomes at least 1 year after the intervention. At the time, 10 programmes were described (six considered universal, two selected, one indicated and one addressing all three levels of risk). The publication of this booklet stimulated other groups to develop their own criteria for effectiveness and their own lists.

Most dominant of these groups are the federal funding agencies for school- and community-based prevention efforts, the Education Department’s Safe and Drug-Free Schools and Communities programme (SDFSC) and the Center for Substance Abuse Prevention (CSAP). There are a number of interesting similarities and differences in how each of these agencies addresses the issue and as a result, the lists that have been compiled have very little overlap (Table 3 and Figure 1). Another important difference between these two listings is that while procedures are in place to update and add newly evaluated prevention strategies to the CSAP list, there are no such procedures in place for the SDFSC list. The fact that funding is tied to selecting only from these listings has both positive and negative effects. The positive impact of implementing strategies with demonstrated successful outcomes has made communities more accountable and, thus, more concerned about delivering prevention strategies that have demonstrated success. On the other hand, the lack of consistent criteria and listings both confuses and upsets community groups, particularly those that may have prevention programming already in place. Furthermore, not only is there a heavy emphasis on selecting ‘evidence-based’ strategies but funding is also dependent on demonstrating need or defining the community drug abuse problem. Often communities will identify their needs but find that there are no evidence-based strategies available on the lists to meet them.

Table 2: National Institute on Drug Abuse — principles of prevention

Prevention programmes should enhance protective factors and reverse or reduce risk factors

Prevention programmes should address all forms of drug abuse, alone or in combination, including the underage use of legal drugs (e.g. tobacco or alcohol); the use of illegal drugs (e.g. marijuana or heroin); and the inappropriate use of legally obtained substances (e.g. inhalants), prescription medicines or over-the-counter drugs

Family-based prevention programmes should enhance family bonding and relationships and include parenting skills; practice in developing, discussing and enforcing family policies on substance abuse; and training in drug education and information

Prevention programmes can be designed to intervene as early as pre-school to address risk factors for drug abuse, such as aggressive behaviour, poor social skills and academic difficulties

Prevention programmes for elementary school children should target improving academic and social–emotional learning to address risk factors for drug abuse, such as early aggression, academic failure and school drop-out

Prevention programmes for middle or junior high and high school students should increase academic and social competence

Prevention programmes aimed at general populations at key transition points, such as the transition to middle school, can produce beneficial effects even among high-risk families and children. Such interventions do not single out risk populations and, therefore, reduce labelling and promote bonding to school and community

Community prevention programmes that combine two or more effective programmes, such as family-based and school-based programmes, can be more effective than a single programme alone

Community prevention programmes reaching populations in multiple settings — for example, schools, clubs, faith-based organisations and the media — are most effective when they present consistent, community-wide messages in each setting

When communities adapt programmes to match their needs, community norms or different cultural requirements, they should retain core elements of the original research-based intervention

Prevention programmes should be long-term with repeated interventions (i.e. booster programmes) to reinforce the original prevention goals. Research shows that the benefits from middle-school prevention programmes diminish without follow-up programmes in high school

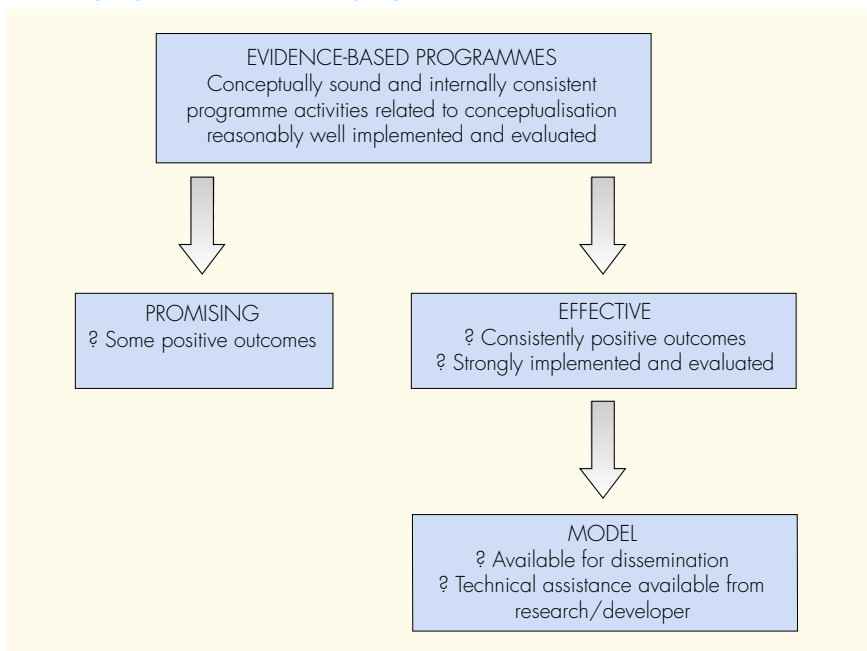
Prevention programmes should include teacher training on good classroom management practices, such as rewarding appropriate student behaviour. Such techniques help to foster students' positive behaviour, achievement, academic motivation and school bonding

Prevention programmes are most effective when they employ interactive techniques, such as peer discussion groups and parent role-playing, that allow for active involvement in learning about drug abuse and reinforcing skills

**Table 3: United States Department of Education — safe, disciplined and drug-free schools: exemplary and promising programmes**

Criterion	
Evidence of efficacy	The programme reports relevant evidence of efficacy/effectiveness based on a methodologically sound evaluation
Quality of programme	The programme’s goal with respect to changing behaviour and/or risk and protective factors are clear and appropriate for the intended population and setting
	The rationale underlying the programme is clearly stated, and the programme’s content and processes are aligned with its goals
	The programme’s content takes into consideration the characteristics of the intended population and setting and the needs implied by these characteristics
	The programme implementation process effectively engages the intended population
Educational significance	The application describes how the programme is integrated into schools’ educational missions
Usefulness to others	The programme provides necessary information and guidance for replication in other appropriate settings

**Figure 1: Substance Abuse and Mental Health Services Administration (SAMHSA) national registry of evidence-based programmes**



## What types of prevention approaches are deemed effective?

The school-based programmes target children generally in middle school when they are around 8–10 years old and have booster sessions that are delivered over a number of years. Several include a homework component that allows students to involve their parents.

The school is an appropriate setting for prevention strategies for a number of reasons. The most obvious is that it is in the schools where children in the USA spend a great proportion of their time. In addition, the school remains a major socialisation institution to reinforce societal values, norms and acceptable behaviours. The school is a protective environment for children (Schaps and Solomon, 2003). Translating these aspects of the school for prevention suggests several approaches that can be taken. As a socialisation agent, the school provides children with knowledge and skills to become competent citizens and it reinforces pro-social attitudes and behaviours. As a protective environment, most schools are substance- or drug-free, provide supervised after-school programmes, and have activities to connect parents and families to school personnel. Of these aspects of the school environment that lend themselves specifically to substance use prevention, it is the cognitive approach to prevention that is the most common and, therefore, the most often evaluated. However, altering the school culture to create an environment that supports anti-drug use norms, beliefs and expectancies and school bonding, that is, connecting the individual to the school experience and community, and implementing appropriate school policy have not been as extensively assessed.

Prevention programmes that target the school culture intend to make the school environment more attractive to students and to help students succeed within the school setting to engage in more pro-social behaviours and in this indirect way reduce the likelihood that students will use alcohol, tobacco or other drugs. The common elements of strategies that attempt to take advantage of and/or impact school culture to provide a positive normative environment for children include: creating anti-/non-substance-using settings (including tobacco, alcohol and other drugs); dispelling misconceptions regarding expectancies (positive experiences) associated with the use of tobacco, alcohol and other drugs; and establishing comprehensive programmes that involve students, school administration and, when appropriate, parents/caregivers (e.g. the Caring School Community; Battistich et al., 2000).

In addition, programmes that address school-bonding share common elements or principles that include: focusing on early years, that is, pre-school to middle school; enhancing competency in reading and mathematics; providing interpersonal skills to relate positively with peers and adults; involving parents in communication and parenting skills and in school activities. Among school-bonding programmes that are



viewed as promising are the Skills, Opportunities and Recognition (SOAR) programme (Hawkins et al., 1999), Incredible Years (Webster-Stratton et al., 2001) and Early Risers Skills for Success (August et al., 2003).

An interesting new area for prevention examines policies related to substance use within the school building. There is a special appeal to developing policies that reach greater numbers of the target population and minimise costs. Common elements or principles of effective school policy approaches include: reducing or eliminating access to and availability of tobacco, alcohol or other drugs; addressing infractions of policies by providing counselling or treatment and special services to the students rather than punishing them through suspension or expulsion; selecting policies that do not disrupt normal school functioning and those that address the full range of drug-using behaviours, from initiation to progression to abuse and dependence and relapse; specification of the substances that are targeted; and reflect other community prevention efforts.

## The challenge of disseminating effective prevention programming

A recent conference sponsored by NIDA and CSAP, 'What do schools really think about prevention research? Blending research and reality' (Kaftarian et al., 2004) brought both researchers and practitioners together to discuss the challenges of diffusing and disseminating effective prevention strategies. Among the greatest mentioned were implementation fidelity (or faithfulness of delivery) and adaptation (Botvin, 2004; Greenberg, 2004; Pentz, 2004).

These concerns arise from studies (Hallfors and Godette, 2002; Ennett et al., 2003) that found that evidence- or research-based programmes taken 'to scale' at the community level often are not implemented as they were designed and evaluated. Although fidelity of implementation is recognised as important, few studies have examined the relationship between level of fidelity and programme outcomes. Tobler and Stratton (1997) suggest that decreases in the effect sizes they found in their meta-analyses of school-based substance abuse prevention programmes taken to scale may be due to implementation issues. Pentz and Trebow (1991) found that children exposed to a programme delivered by instructors who maintained high implementation fidelity had better outcomes than those exposed to the programme delivered by instructors who implemented the programme with low fidelity. Furthermore, children exposed to the programme delivered by low implementers had better outcomes than children in the control condition.





As the field of prevention continues to develop theory- and research-based interventions, the combined issues of fidelity and reinvention will become increasingly important. However, as Dusenbury et al. (2003: 240) emphasise, although the field has fair agreement on the definition of fidelity ('...the degree to which teachers and other program providers implement programs as intended by the program developers'), there does not appear to be a consensus regarding the specific dimensions of fidelity nor on their measurements. Similarly, the degree of adaptation that may take place in the community has not been well studied.

## Conclusions

So where does this leave us? Professionals in the field of substance abuse prevention in the USA have experienced a period of exciting new developments. After a long period of limited success, the 1990s brought the field to a new level of prominence that engaged researcher, practitioner and policymaker to strategically address substance use among our children and adolescents. After rapid dissemination and diffusion of evidence-based prevention strategies, the field has now entered a new period of deliberations and discussions around improving both the extent of prevention programming within the community and the specificity of this programming to meet each community's needs in terms of problem identification, available resources (i.e. social capital and funding), and priorities. Governmental demands for fiscal accountability pose both opportunities and challenges. On one hand, communities are required to deliver 'evidence-based' prevention programming, while on the other hand researchers and practitioners are not in agreement as to what that means. To further complicate the issue, the proposed federal budget for fiscal year 2006 shows reduced funding for demand reduction activities, particularly prevention, placing a greater load on states and local governments and the private sector for support. Funding for the much-needed research, now solely the responsibility of NIDA, will remain flat or will increase negligibly. Given the costs for conducting rigorous evaluation research studies, these potential obstacles portend that few, if any, much needed new prevention strategies will be forthcoming.

## References

- August, G. J., Lee, S. S., Bloomquist, M. L., Realmuto, G. M., Hektner, J. M. (2003), 'Dissemination of an evidence-based prevention innovation for aggressive children living in culturally diverse, urban neighborhoods: the Early Risers effectiveness study', *Prevention Science* 4: 271–286.
- Bandura, A. (1977), *Social learning theory*, Prentice Hall, Englewood Cliffs, NJ.
- Bangert-Drowns, R. L. (1988), 'The effects of school-based substance abuse education: a meta-analysis' *Journal of Drug Education* 18: 243–264.
- Battistich, V., Schaps, E., Watson, M., Solomon, D., Lewis, C. (2000), 'Effects of the Child Development Project on students' drug use and other problem behaviors', *The Journal of Primary Prevention* 21: 75–99.



- Botvin, G. J. (2004), 'Advancing prevention science and practice: challenges, critical issues, and future directions', *Prevention Science* 5: 69–72.
- Botvin, G. J., Griffin, K. W. (2003), 'Drug abuse prevention curricula in schools', in Sloboda, Z., Bukoski, W. J. (eds), *Handbook of drug abuse prevention: theory, science and practice*, Kluwer Academic, New York, 45–74.
- Brunvold, W. (1993), 'A meta-analysis of adolescent smoking prevention programs', *American Journal of Public Health* 6: 872–880.
- Brunvold, W., Rundell, T. (1988), 'A meta-analysis and theoretical review of school based tobacco and alcohol interventions', *Psychology and Health* 2: 55–73.
- Bukoski, W. J. (2003), 'The emerging science of drug abuse prevention' in Sloboda, Z., Bukoski, W. J. (eds), *Handbook of drug abuse prevention: theory, science and practice*, Kluwer Academic, New York, 3–24.
- Cuijpers, P. (2002), 'Effective ingredients of school-based drug prevention programs: a systematic review', *Addictive Behaviors* 27: 1009–1023.
- Dusenbury, L., Brannigan, R., Falco, M., Hansen, W. B. (2003), 'A review of research on fidelity of implementation: implications for drug abuse prevention in school settings', *Health Education Research* 18: 237–256.
- Ennett, S. T., Ringwalt, C. L., Thorne, J., Rohrbach, L. A., Vincus, A., Simons-Rudolph, A., Jones, S. (2003), 'A comparison of current practice in school-based substance use prevention programs with meta-analysis findings', *Prevention Science* 4: 1–14.
- Faggiano, F., Vigna-Taglianti, F., Versino, E., Zambon, A., Borraccino, A., Lemma, P. (2005), 'School-based prevention for illicit drugs use', *Cochrane Database System Review*, Issue 2. Art. No.: CD003020.pub2. DOI: 10.1002/14651858.
- Greenberg, M. (2004), 'Current and future challenges in school-based prevention: the researcher perspective' *Prevention Science* 5: 5–13.
- Hallfors, D., Godette, D. (2002), 'Will the 'principles of effectiveness' improve prevention practice? Early findings from a diffusion study', *Health Education Research* 17: 461–470.
- Harachi, T. W., Abbott, R. D., Catalano, R. F., Haggerty, K. P., Fleming, C. B. (1999), 'Opening the black box: using process evaluation measures to assess implementation and theory building', *American Journal of Community Psychology* 27: 711–731.
- Hawkins, J. D., Catalano, R. F., Miller, J. Y. (1992), 'Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention', *Psychological Bulletin* 112: 64–105.
- Hawkins, J. D., Catalano, R. F., Kosterman, R., Abbott, R., Hill, K. G. (1999), 'Preventing adolescent health-risk behaviors by strengthening protection during childhood', *Archives of Pediatric and Adolescent Medicine* 153: 226–234.
- Kaftarian, S., Robertson, E., Compton, W., Davis, B. W., Volkow, N. (2004), 'Blending prevention research and practice in schools: critical issues and suggestions', *Prevention Science* 5: 1–3.
- Kandel, D. B. (1975), 'Stages in adolescent involvement in drug use', *Science* 190: 912–914.
- Kandel, D. B. (1988), 'Issues of sequencing of adolescent drug use and other problem behaviors', *Drugs and Society* 3: 55–76.
- Kandel, D. B., Yamaguchi, K. (1999), 'Developmental stages of involvement in substance use', in Tarter, R. E., Amerman, R. M., Ott, P. J. (eds), *Sourcebook on substance abuse: etiology, epidemiology, assessment, and treatment*, Allyn and Bacon, Needham Heights, MA, 50–74.
- Nation, M., Crusto, C., Wandersman, A., Kumpfer, K. L., Seybolt, D., Morrissey-Kane, E., Davino, K. (2003), 'What works in prevention: principles of effective prevention programs', *American Psychologist* 58: 449–456.
- Newcomb, M. D., Bentler, P. M. (1986), 'Frequency and sequence of drug use: a longitudinal study from early adolescence to young adulthood', *Journal of Drug Education* 16: 101–120.





- Pentz, M. A. (2004), 'Form follows function: designs for prevention effectiveness and diffusion research', *Prevention Science* 5: 23–29.
- Pentz, M. A., Trebow, E. (1991), 'Implementation issues in drug abuse prevention research', *NIDA Research Monograph* 107: 123–139.
- Schaps, E., Solomon, D. (2003), 'The role of the school's social environment in preventing student drug use', *Journal of Primary Prevention* 23: 299–320.
- Schaps, E., DiBartolo, R., Moskowitz, J., Palley, C. S., Churgin, S. (1981), 'A review of 127 drug abuse prevention program evaluations', *Journal of Drug Issues* 11: 17–43.
- Sloboda, Z. (2003), 'Forging a relationship between drug abuse epidemiology and drug abuse prevention', in Sloboda, Z., Bukoski, W. J. (eds), *Handbook for drug abuse prevention: theory, science, and practice*, Kluwer Academic, New York, 245–264.
- Sloboda, Z., David, S. L. (1997), *Preventing drug use among children and adolescents: a research-based guide*, NIH Publication, Bethesda, Maryland.
- Tobler, N. S. (1992), 'Drug prevention programs can work: research findings', *Journal of Addictive Diseases* 11: 1–28.
- Tobler, N. S. (2000), 'Lessons learned', *The Journal of Primary Prevention* 20: 261–274.
- Tobler, N. S., Stratton, H. H. (1997), 'Effectiveness of school-based drug prevention programs: a meta-analysis of the research', *The Journal of Primary Prevention* 18: 71–128.
- Tobler, N. S., Lessard, T., Marshall, D., Ochshorn, P., Roona, M. (1999), 'Effectiveness of school-based drug prevention programs for marijuana use', *School Psychology International* 20: 105–137.
- Webster-Stratton, C., Reid, J., Hammond, M. (2001), 'Preventing conduct problems, promoting social competence: a parent and teacher training partnership in Head Start', *Journal of Clinical Child Psychology* 30: 282–302.





# Chapter 13

## Cannabis users in drug treatment in Europe: an analysis from treatment demand data

**Keywords:** cannabis – EMCDDA – epidemiology – treatment – treatment demand

### Setting the context

This chapter analyses the 2005 data on people entering drug treatment for primary cannabis use in the Member States. For several years, the EMCDDA has reported an increasing number of people reported as seeking treatment for cannabis use. Although definitive reasons for this are difficult to specify, it is clear that the explanation is multi-faceted and requires careful study before drawing firm conclusions (Simon, 2004).

Cannabis treatment, like cannabis use, is usually a young person's phenomenon. As with the use of other types of drugs, treatment for cannabis attracts more males than females. While most cannabis treatment clients begin use early in their lives, the spread of ages amongst those now entering treatment is much broader, and their drug use reaches beyond cannabis to include other illicit drugs also, such as cocaine, other stimulants and, occasionally, opiates (EMCDDA, 2003a).

Recent years have shown an increase in demand for cannabis treatment in most Member States, even though there are important differences between the countries. In particular, there has been an increase in the number of adolescents reporting social and psychological problems related to cannabis use, for which they themselves, their families or their school request specialised help (EMCDDA, 2003a). A number of factors may explain the reported increase, for example a simple improvement of data coverage in the EMCDDA reporting system, expansion of treatment availability, or an increased number of referrals to treatment by the criminal justice system and by the client's social networks. The reported pattern of use of cannabis in the period immediately prior to treatment has been changing, and this does not just mean an increase in the number of users reporting frequent use.



## Cannabis users in drug treatment in Europe: an analysis from treatment demand data

People seeking treatment specifically for cannabis use now represent a significant proportion of overall drug treatment requests across Europe, though differences between countries are substantial. Some countries, such as France, Germany, Hungary and Denmark, currently have very high percentages of cannabis clients among people in treatment. Other countries, such as Lithuania, Luxembourg, Romania and Portugal, report low percentages.

This chapter argues that further investigation of cannabis consumption patterns and related problems could identify areas where specialised drug services might provide interventions, targeted not only at regular cannabis users but also at any other adolescent cannabis users with social, behavioural or psychological problems.

### Further reading

Copeland, J. (2004), 'Developments in the treatment of cannabis use disorder', *Current Opinion in Psychiatry* 17(3): 161–167.

EMCDDA, *Annual report*, published each year in November.

UNODC and EMCDDA (2006), *Guidance for the measurement of drug treatment demand*, United Nations Office on Drugs and Crime and European Monitoring Centre for Drugs and Drug Addiction, Vienna and Lisbon.



# Cannabis users in drug treatment in Europe: an analysis from treatment demand data

Linda Montanari, Colin Taylor and Paul Griffiths

## Introduction

Cannabis is the most widely used illicit drug in Europe and its use is one of the most frequent reasons cited for entering drug treatment. In 2005, 20% of all drug clients and 29% of new drug clients (EMCDDA, 2007a, b) <sup>(1)</sup> entered treatment for problems related to their primary cannabis use. In recent years, drug services in the European Union have reported a more or less steady increase in the number of people seeking treatment because of problems related to their cannabis use, making cannabis-related treatment an increasingly larger proportion of drug treatment demands. In terms of overall treatment demand, cannabis now lies behind only the main problem drug type, opiates, and is ahead of demands for cocaine-related treatment.

In this chapter, the increase in treatment demand and its implications are analysed through data collected under the treatment demand indicator (TDI), a pan-European instrument used to monitor data on people entering treatment for drug use (EMCDDA and Pomicidou Group, 2000) <sup>(2)</sup>.

This chapter highlights a number of key questions arising from the increase in the reported demand for cannabis treatment. To build a clear picture of the changing situation, it is fundamental to understand how each of these questions is driving the current changes in treatment demand.

- Does this increase in reported demand represent an increase in the number of people in need of help for cannabis use?
  - If so, to what extent does it result from an increase in use of cannabis in the general population — in particular, regular and intensive use?

<sup>(1)</sup> See figure TDI-G02 in the Statistical bulletin 2007.

<sup>(2)</sup> The TDI is called the treatment demand indicator protocol, but in fact it counts the number of people starting a drug treatment for their drug use, as written in the TDI definition. The people asking for, but not receiving treatment, are not recorded. People sent to treatment centres not on their own initiative are also included in the reported data.



- If so, to what extent is it related to other changing factors among drug users, such as their changing patterns of drug use? To what extent is it related to physical, social or psychological problems among cannabis users themselves?
- Can this increase be explained by factors independent of an increased need for help? Explanations might include:
  - improvements in the coverage of the treatment reporting system;
  - expansion of the types of treatment facilities available, and, in particular, specific treatment services targeting adolescents and young people, that reach out to and attract the cannabis user population more effectively than before;
  - an increase in referrals to treatment, affecting cannabis users who would not otherwise have sought help spontaneously; and
  - linked to the above, an increase resulting from changes in the way cannabis or other drug use is dealt with by the criminal justice system, within schools, or by agencies working with young people.

The analysis presented here is a broad one, describing trends across several countries in the EU. The chapter questions the extent to which the overall European picture is reflected in each of the individual countries, and whether some countries have a different pattern of change in treatment demand.

## Method and sources for data collection

The data presented in this chapter are primarily obtained through a standard protocol used by all EU countries, the TDI, a joint EMCDDA–Pompidou Group Protocol (EMCDDA and Pompidou Group, 2000). The protocol establishes harmonised definitions across 20 questionnaire items. These items relate to drug-related information, socio-demographic data and use of services, and aim to obtain consistent information on the number, characteristics and patterns of use of people entering treatment for drug use. From 2000 onwards, European Member States have collected data using the TDI to provide information on trends in the treatment of problem drug use. The indicator serves several purposes: prevalence estimation; identification of patterns of drug use and use of services; service planning; and service evaluation.

TDI data can be regarded as providing a reasonably robust and useful representation of the characteristics of clients referred to specialised drug services within the EU. However, there are limitations that must be borne in mind, as achieving comparability in data from all EU Member States is not easy. While departures from EU comparability persist, they are believed not to distort the broader picture of drug treatment patterns.



One limitation of the EMCDDA's data is the extent of 'double-counting' of clients. The number of people entering treatment each year is defined so as to count only one episode — that is, a single treatment demand — each year. The task of excluding 'repeat' treatment episodes should therefore ideally be controlled centrally in each country, yet in practice some countries' collection procedures cannot use controls at a national level, resulting in a slightly higher count of people. A further potential lack of comparability is that treatment for cannabis as the primary drug of abuse is defined in the protocol as cannabis being 'the drug that causes the client the most problems'. Different treatment systems may interpret this differently. Reporting can be based on problems as defined by clients themselves, or on short diagnoses based on the ICD-10. When the primary drug is unclear, usually what is reported is the drug most frequently used, or the drug considered most important for the potential consequences on the health and social situation of the client.

A stronger caveat must be voiced on how far we can generalise from the consolidated European data set. The single factor that impacts most heavily on interpreting the findings is the potential for under-reporting, which arises from the varying extent to which the reporting system succeeds in covering, each year, all the relevant treatment facilities in each Member State. It must be remembered that treatment facilities are not fixed: new agencies might enter the reporting system and old ones leave it. Monitoring the effect of these changes is a continuing part of data collection, and is the subject of current work (see, for example, Simon, this monograph, on the German situation).

The EMCDDA's TDI data nonetheless remains the major pan-European body of data on treatment. The discussion based on this information source will focus on four main areas:

- profiling cannabis treatment clients — their socio-demographic characteristics (age, gender, living and social conditions);
- describing patterns of drug use amongst treatment clients (age at first use, frequency of use and combination with other drugs);
- incidence of client treatment in Europe, and a comparison with general population data on cannabis use; and
- referral routes into treatment for cannabis.

The TDI provides good short-term trend information in these four areas, although longer-term longitudinal data — 1999 to 2005 — on treatment demand in 20 European countries are available <sup>(3)</sup>. For some socio-demographic characteristics (education, labour and living status) — and for information on source of referral — only two years

<sup>(3)</sup> See figure TDI-01 in the Statistical bulletin 2007, which provides methodological details on trends calculations.



of data (2001/2002) are available, for seven countries. In these seven countries, a specific exercise, not available for other years, was conducted.

Discussion of patterns of drug use, profile of clients and sources of referrals to treatment is restricted to outpatient clinics, since these data have the most consistent coverage of clinics and individuals.

## Cannabis treatment clients

Overall, cannabis is the most used illicit drug in Europe and, over recent years, it has risen to become the second most frequently cited drug reported as the primary reason for entering specialised drug treatment, after opiates. According to the TDI data in 2005, around 20% of all treatment clients and 29% of first-time treatment clients were recorded as having a primary cannabis problem <sup>(4)</sup> (EMCDDA, 2007a, b).

Polydrug use is often reported among cannabis users. Among drug clients, cannabis can be registered as a primary drug, or a secondary drug used along with other substances. Among all drug clients entering treatment for primary cannabis use, alcohol (37%) or amphetamines or ecstasy (28%) were reported as the most frequent secondary drugs <sup>(5)</sup>. However, a proportion of clients reported cocaine use (15%) and/or other opioid use (7%) as secondary drugs, with cannabis reported as the primary drug for treatment. Although few in number, these clients are an interesting group who could be more carefully examined to better understand patterns of drug use and related problems.

Among all outpatient treatment clients reported by a clinic's staff, cannabis may also be cited as a secondary problematic drug. After alcohol (38%), cannabis is reported as the second most frequently cited secondary substance (17%) by those receiving drug treatment <sup>(6)</sup>. When treatment clients cite cannabis as a secondary drug, analysis shows that overall cannabis use is frequently reported as a secondary reason for entering treatment among primary cocaine users (28%), primary users of other stimulants (26%) and primary opiate users (17%). Similar drug combinations are also found in the American treatment data. Analysis of American treatment data shows that marijuana appears to be the secondary reason for seeking treatment among clients using alcohol (56%), cocaine (21%), stimulants (11%) and opiates (10%) (DASIS, 2003).

Thus it seems that a group of primary cannabis clients exists which also uses other drugs in combination with cannabis. Cannabis can be combined with alcohol, amphetamines or ecstasy, but also with other, 'harder', drugs such as cocaine or heroin. Among

<sup>(4)</sup> See figure TDI-02 in the Statistical bulletin 2007.

<sup>(5)</sup> See table TDI-23 in the Statistical bulletin 2007.

<sup>(6)</sup> See table TDI-22 in the Statistical bulletin 2007.



polydrug users including cannabis, and especially in those clients reporting use of the 'hard' drugs, it is not clear what the role of cannabis is in the request for treatment. Polydrug use has become more common in recent years and cannabis might be just one among other substances that gives rise to users entering treatment. Limitations in data recording, and the small number of absolute cases reported in some countries should be considered also.

For simplicity, to analyse changes and trends we have considered here only the group of clients reporting cannabis as the primary drug for the first time in their life. Nevertheless, this information must be seen in the context of a changing and expanding reporting system, the implications of which are discussed below.

When looking at socio-demographic characteristics of cannabis clients, the following picture emerges. Cannabis clients new to treatment are predominantly young males. The highest male to female ratio among all drugs clients is found among these new outpatient clients (6 males:1 female) <sup>(7)</sup>. Higher male to female ratios are found in Italy, Portugal, Hungary, Germany, with lower ratios in the Czech Republic, Sweden, Finland and the United Kingdom. These differences in the male to female ratios among countries is quite similar across the other primary drugs of use. Almost all new clients entering treatment for primary cannabis use are younger than 30, and almost 40% are younger than 20. The mean age of cannabis clients is 24 years, whereas in the case of other drugs, this age is generally higher. Country differences are found in the age distribution of cannabis clients <sup>(8)</sup>. Among the group of people under 20 years old receiving drug treatment, the vast majority reports using cannabis as the primary drug (80% among people under 15, 67% among those aged 15–19) <sup>(9)</sup>.

The age of first cannabis use — onset — is important, since it has been reported that the younger the age at which users first consume cannabis, the higher the risk of developing drug problems in the future (Kraus et al., 2003). Compared with other drug types, which show considerable variation across countries, age of first cannabis use among clients requesting treatment for cannabis is quite similar across countries in Europe. In the TDI data for cannabis clients starting treatment for the first time, the mean age of starting cannabis use is 17 years. Virtually all new cannabis clients start their drug use before they are 20 and 33% before they are 15. The corresponding figures for opiates are 45% before 20 years old, and 5% before 15 years old, and for cocaine, 48% and 6%, respectively <sup>(10)</sup>. A comparison of age of onset with age first treated shows that there is a time lag of around 7 years between first cannabis use

<sup>(7)</sup> See table TDI-22 in the Statistical bulletin 2007.

<sup>(8)</sup> See tables TDI-10 and TDI-102 in the Statistical bulletin 2007.

<sup>(9)</sup> See table TDI-10 in the Statistical bulletin 2007.

<sup>(10)</sup> See table TDI-11 in the Statistical bulletin 2007.



and first drug treatment, regardless of where treatment is sought (that is, in different countries and in different types of treatment centre).

Finally, looking at available data on other social characteristics in 2002 <sup>(11)</sup>, the relatively young age of cannabis clients means that a large proportion, 45%, are still in education, compared with only 8% amongst clients being treated for problems with other drugs. A further 24% of those being treated for cannabis problems are in regular employment, equal to the percentage who are unemployed. This is in stark contrast to clients using drugs such as heroin, among whom very few are employed. In addition, cannabis clients more often report living in stable accommodation than those being treated for problems with other drugs, reflecting the fact that many are young people, students, or living with their parents (Agosti and Levin, 2004). However, a few countries, such as Greece, also report a number of primary cannabis clients who are older, in more precarious social conditions and using other drugs together with cannabis (EMCDDA, 2004).

To conclude, the most common characteristics of cannabis clients are that they are young male, a student/school pupil and living with parents. However, there are also indications of cannabis clients who are older or less socially well-integrated. The same patterns were found in the recent review of cannabis specialised treatment reported by Rødner Sznitman (this monograph).

## Incidence of demands for cannabis treatment

Based on data that were available in 19 EU countries, there are on average 41 persons per 100 000 young adults (aged 15–34) each year who enter treatment for cannabis use for the first time. Only a tiny proportion — 1 in 200 — last-month cannabis users in the young adult population (aged 15–34) report entering specialised drug treatment for cannabis use (Table 1). A 2004 detailed review of cannabis treatment demand, conducted by the Dutch National Alcohol and Drugs Information System (LADIS), confirms that only a small proportion of regular cannabis users in the Netherlands receives drug treatment.

Major differences are found between countries in the TDI data set in the proportion of clients seeking treatment for cannabis. This varies considerably, from 3% in Bulgaria to 48% in France and 36% in Hungary. In terms of new clients, there are also large differences between countries, with cannabis clients reaching an almost 70% share of new clients entering drug treatment in France <sup>(12)</sup>. In general, a high prevalence of

<sup>(11)</sup> An ad hoc data collection on social characteristics of cannabis clients was done in 2002, yet is not available for other years.

<sup>(12)</sup> See tables TDI-04 and TDI-05 in the Statistical bulletin 2007.

**Table 1: Treatment demand for cannabis as primary drug among new drug clients and last-month prevalence of cannabis use among young adults in 2005 or most recent year available: incidence per 100 000 young population at 1 January 2006**

Country	% cannabis clients of last-month prevalence, young adults	New cannabis clients in 2005 of the total clients (%)	New cannabis clients 2005 (absolute numbers)	Cannabis clients per 100 000 young adult population	Last-month cannabis prevalence, young adults 2005 or most recent year available (%)	Last-month prevalence, young adults 2005 or most recent year available (absolute numbers)	General population, young adults (15–34) in 2006 (1 January)
Bulgaria	0.1	9.3	36	2	1.7	37 213	2 188 992
Czech Republic	0.3	20.5	896	29	9.8	301 960	3 081 224
Denmark	1.1	52.6	830	63	5.9	78 124	1 324 139
Germany	0.5	58.0	8 139	42	7.6	1 485 409	19 544 850
Ireland	1.4	40.2	807	60	4.3	58 055	1 350 110
Greece	0.5	10.1	225	7	1.5	45 573	3 038 209
Spain	0.3	20.3	5 312	42	15.5	1 971 238	12 717 663
France	0.2	67.3	2 804	17	9.8	1 608 241	16 410 618
Italy	0.7	24.1	8 477	58	8.8	1 290 733	14 667 416
Cyprus	1.7	40.2	84	35	2.1	5 025	239 305
Latvia	0.3	17.0	68	10	3.7	25 200	681 077
Lithuania	0.0	0.3	1	0	1.5	14 867	991 130
Hungary	4.0	52.0	3 286	113	2.8	81 440	2 908 578
Netherlands	0.8	41.8	1 797	44	5.6	228 066	4 072 607
Portugal	0.4	11.4	552	19	4.4	129 324	2 939 173
Slovakia	0.5	28.8	277	16	3.3	57 968	1 756 615
Finland	0.4	34.0	215	17	4.0	51 802	1 295 042
Sweden	1.2	31.6	422	19	1.5	34 200	2 279 985
United Kingdom	0.5	21.9	9 400	59	11.6	1 844 191	15 898 200
Total	0.5	29.0	43 628	41	8.7	9 348 627	107 384 933

Notes: only countries that sent information about first treatments are included.

Source: 2006 Reitox National reports, Standard Table 3. For total number of clients see table TDI-2. For population see Eurostat, demographic data 2006 (<http://epp.eurostat.ec.eu.int>).



cannabis use reported in the general population is associated with a high percentage of primary cannabis users among treatment clients. In particular, the available data show that countries with high or low last-month prevalence in the young adult population (15–34 years) have correspondingly high or low incidence of cannabis as a share of treatment demand. However, there are a few exceptions: in some countries, high levels of last-month cannabis prevalence in the young adult population contrast with low levels of treatment demand for cannabis and vice versa (Cyprus, Hungary, France, Portugal — see Table 1).

The reasons for discrepancies between use and treatment across countries are presumably historically rooted, in both the development of treatment centres and in attitudes to treatment, as well as prevalence and patterns of cannabis use. In cases where high levels of recent cannabis prevalence contrast with low proportions of treatment demand, this could imply that treatment availability for cannabis is insufficient or not appropriate. On the other hand, it could simply be because there is no perceived need for drug treatment. As shown elsewhere (Corrigan, Beck and Legleye, this monograph), it is uncertain to what extent cannabis use triggers a need for treatment. In other cases, where high demand for cannabis treatment contrasts with low recent cannabis prevalence, this might arise from more restrictive national legislation, or a widespread medical approach to dealing with cannabis problems.

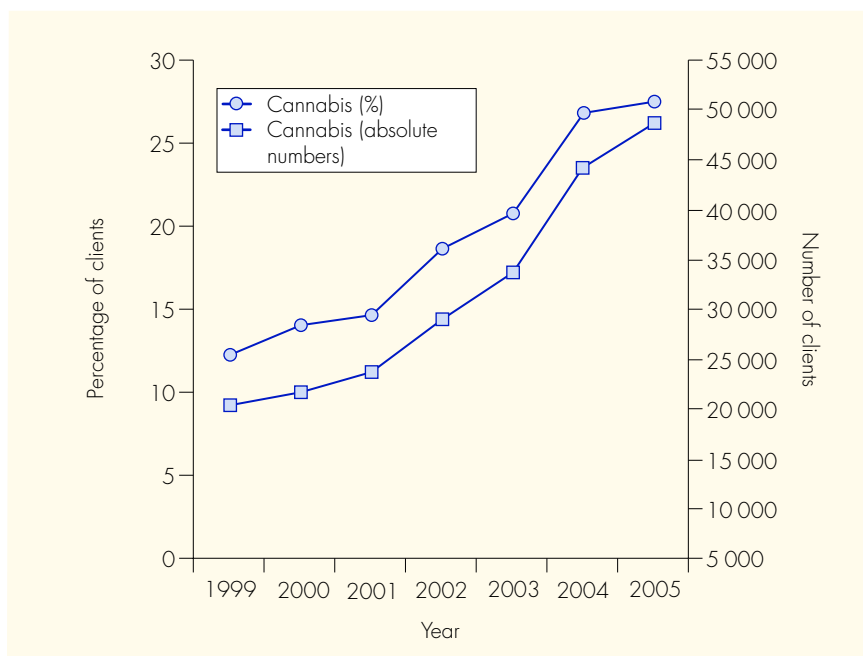
Even if cannabis is the most used drug in Europe, only a minor part of the population uses it on a regular basis, and an even smaller proportion demands drug treatment (Agosti and Levin, 2004; Toxibase and Crips, 2004). One of the various observations that may be made from this is that demand for cannabis treatment does not always mirror, in a logical and straightforward way, the cannabis prevalence rates in the general population. Instead, it is clear that the extent of demand for cannabis treatment is a complex issue that is probably related to several factors which lie beyond variations in reporting coverage. Contenders for explaining this phenomenon include prevalence of intensive cannabis users in the general population, availability of treatment, patterns of referral to treatment and national legislation.

### Trends in treatment incidence

Between 1999 and 2005, according to the TDI information from 20 countries, the number of new clients entering treatment for cannabis as a primary drug increased by 28 000, from around 15 000 to almost 44 000 reported cases. In 1999 the proportion of new cannabis clients represented around 12% of the total of the new clients, while in 2005 it reached almost 28% (Figure 1). In 11 countries there was an increase in the proportion of cannabis clients, and in 11 countries a stable or slightly decreasing trend was noted. The highest growth was reported in Hungary (+ 40%) and France (+ 37%), followed by Slovakia, Germany, Malta, Denmark and The Netherlands (around



**Figure 1:** Trends in new cannabis treatment demands from 1999 to 2005 (proportion of total clients and absolute numbers)



Notes: Missing data were interpolated by assigning for the respective country the EU average year-on-year trend from available data. Altogether, 14% of data points and 21% of the number of clients were interpolated. Countries included: Bulgaria, Czech Republic, Denmark, Germany, Greece, Spain, Ireland, France, Italy, Hungary, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, United Kingdom. In the case of Romania, the 2001 proportion of heroin clients among all new clients was used to estimate their 2000 and 1999 number based on all new clients number.

Source: 2006 Reitox National reports – Standard Table 4 – New clients.

+ 20%) while the smallest growth was found in Poland, Portugal, the Czech Republic and Romania <sup>(13)</sup>. An analysis carried out in England on cannabis treatment demand confirmed this upward trend (DMRD, 2004).

Compared with other substances, primary cannabis treatment demands increased faster than demands for treatment of other drugs. In the same time period, new heroin clients decreased by 32%, cocaine clients increased by 11% and other stimulant users increased by 4%. This reported increase in cannabis treatment demand is not restricted to Europe. In the USA, where a different drug treatment registration system is used <sup>(14)</sup>,

<sup>(13)</sup> See table TDI-03 in the Statistical bulletin 2007.

<sup>(14)</sup> In the USA, admissions to treatment rather than individuals are registered. In addition, in contrast to Europe, alcohol is included among the substances of abuse. See the SAMHSA website ([www.samhsa.gov](http://www.samhsa.gov)); note that in the USA, Canada and Australia the term 'marijuana' is used because the term 'hashish' (cannabis resin) is not common.



## Cannabis users in drug treatment in Europe: an analysis from treatment demand data

treatment admissions for marijuana increased from around 20 000 in 1992 to nearly 90 000 in 2000 (SAMHSA, 2003; EMCDDA, 2003b).

Looking at the factors that might have influenced the reported trends, changes are seen in the following areas:

- reporting system and data coverage;
- drug services organisation;
- sources of referrals to treatment;
- socio-demographic characteristics; and
- patterns of drug use and, in particular, frequency of cannabis use.

The coverage of the European reporting system has expanded in recent years, with an increase in number of units and clients recorded by the system. It is unclear to what extent this represents a genuine expansion in treatment offering, as opposed to simply the coverage of the treatment reporting system. It is also unclear how treatment offering and reporting coverage may have affected the increase in cannabis treatment demands. Nevertheless, this growth is not sufficient to explain the increase in cannabis treatment demands (EMCDDA, 2003b) <sup>(15)</sup>.

The organisation of drug treatment services has changed in recent years. Because of the decrease in proportion of heroin clients, centres have adapted treatment offerings to embrace a differentiated client population that includes cocaine and cannabis users. This shift in targeted clients might have influenced demand for treatment. In particular, countries such as France — where a high proportion of cannabis users is found among all treated clients — have created treatment centres for target groups, such as adolescents, and these have reported a substantial proportion of cannabis clients (EMCDDA, 2003b). Overall, such centres might have added ‘weight’ to the share of cannabis users among all treatment clients.

### Referral routes into treatment

It is important to identify the channels through which people enter treatment. A number of standard options are available in the TDI schedule for recording the source of referral for drug users entering treatment. These distinguish (i) drug users who have referred themselves and (ii) those who have been referred through other agencies such as health, social or criminal justice agencies. Most cannabis clients are referred by family and friends, social services or the criminal justice system. In comparison with users of other drugs, a smaller proportion of cannabis clients are self-referrals (EMCDDA, 2004). A similar picture is also seen in the USA and Canada, where treatment demand for

<sup>(15)</sup> See table TDI-02 in the Statistical bulletin 2007.



marijuana as a primary substance is largely found not to be self-initiated (EMCDDA, 2003b). In countries with significant percentages of primary cannabis clients, legal authorities and schools play an important role in referring cannabis clients (EMCDDA, 2003a). In an American analysis of marijuana admissions to treatment based on source of referral (DASIS, 2005), marijuana admissions referred by criminal justice were also reported to have a different profile from non-criminal justice referrals: they were younger, with a higher presence of males, and often occasional users of cannabis with no other additional drugs.

Some understanding of the reasons for increases in treatment uptake may be found in analysing the changes in the sources of referral to treatment. Between 2001 and 2002, in those countries reporting data <sup>(16)</sup>, the total number of cannabis clients referred to treatment services by hospital/medical sources and by legal authorities increased by 79% and 58% respectively, while the known base of clients increased by 37%. By comparison, from 1992 to 2002 the USA also reported increases in marijuana admissions referred by the criminal justice system (EMCDDA, 2004).

One of the more problematic measures in the EMCDDA's TDI is the frequency of use of the primary drug in the period immediately before entering treatment. Intended to give insight into, amongst other things, the severity of problem to be treated, in practice this measure can be strongly tied to the route of referral and how treatment entry comes about. Often this 'frequency of use' item records, strangely, no or little use of the primary drug in the period in question — a phenomenon that might be related to referrals from criminal justice, or from a health agency positioned earlier in a referral chain. As such, it is difficult to separate its interpretation from referral patterns. For example, among clients in treatment for a primary cannabis problem in 2005, 30% of new cannabis clients use the drug occasionally or have not used in the month prior to treatment, while 40% use it daily <sup>(17)</sup>. There are again large differences between countries: the highest proportion of daily cannabis users is found in the Netherlands, Denmark and Spain, and the highest proportion of occasional users — including clients who may not have used in the past month — are found in Hungary, Germany and Italy. Compared with the other drugs, in the case of cannabis there is a higher polarisation of patterns of use between occasional users — including non-users — and daily users. The same patterns are also found in American analysis (NSDUH, 2004).

Among new cannabis users presenting to treatment between 2003 and 2005, the proportion of daily users increased by more than 10% <sup>(18)</sup>. A number of factors may be behind this increase, for example artefacts of reporting measures, polydrug use,

<sup>(16)</sup> The countries reporting in these years were Finland, Germany, Greece, Norway, Sweden and the United Kingdom.

<sup>(17)</sup> See table TDI-18 in the Statistical bulletin 2007.

<sup>(18)</sup> See table TDI-18 in the Statistical bulletin 2007.



and mental health problems among cannabis clients. A number of countries report polydrug use where cannabis is reported as the primary substance, yet accompanied by the use of alcohol and other drugs. In these cases, it is not totally clear which drug precipitates treatment-seeking, even though cannabis might be declared as the primary problem. Some countries have examined a purported relationship between mental health problems and cannabis use, and specific research has been carried out to investigate this relation. The scientific literature indicates that it is not always clear whether problematic cannabis use comes before a mental health problem, contributing to its appearance or discovery, or whether cannabis is used as a kind of medication for pre-existing mental health problems (see Witton, this monograph). However, there is a group of people that regularly uses cannabis and seeks help for problems that may be related to their cannabis use. This should be seriously taken into consideration by the treatment system, and be better investigated by researchers.

## Conclusions

The objective of this review has been to describe the observed increase in reported cannabis treatment demand, and to analyse the changing reporting environment to better understand the trend. In doing so, it has become apparent that many important questions that are fundamental to an informed policy debate on this controversial topic remain unanswered. What is also apparent is that the available evidence justifies neither an alarmist position nor complacency on cannabis treatment demand.

People with cannabis-related problems constitute a non-trivial proportion of treatment demands in specialised facilities in some countries, and form an important subgroup within the larger treatment population. Most are young males, typically around 20 years old, and most started using cannabis at around 17 years of age.

Cannabis clients have different patterns of drug use from those consuming other substances. Moreover, there are important differences between cannabis clients, and the profiles of different subgroups of cannabis users in treatment are likely to be directly relevant to understanding their needs and the provision of appropriate responses. Important dimensions for service provision include frequency of use, current and past use of other drugs, and referral source. In broad terms, summarising the available information at EU level, two client profiles can be postulated (EMCDDA, 2004):

- at one extreme, younger users, often students, referred to treatment services by family or school, and consuming only cannabis or sometimes together with alcohol or stimulants; and
- at the other extreme, polydrug users who are typically older and less socially well-integrated, and who are referred to treatment more often by legal authorities or health and social services, and who overlap with the chronic drug-using population.



In reflecting on changes in the characteristics of primary cannabis treatment demand over time, the available information suggests that there were increases in:

- numbers of clients referred from the criminal justice system;
- referrals from family and other social support networks (family, friends, social services, school);
- the proportion of people using cannabis intensively (daily cannabis use), although daily users remain in the minority; and
- levels of social and educational problems in some countries (although data in this area are still weak).

In considering the increase in treatment demand, it appears that changes in referral practice have an impact, and a substantial proportion of those referred appear not to be intensive drug users. Nonetheless, in some countries at least, a significant number of treatment demands come from individuals whose use of cannabis is intensive. The problems experienced by this group remain poorly understood, and research in this area is urgently needed. The observation that a majority of treatment demands made by the very young are for cannabis suggests that special consideration of the needs, referral pathways and responses of this group is required.

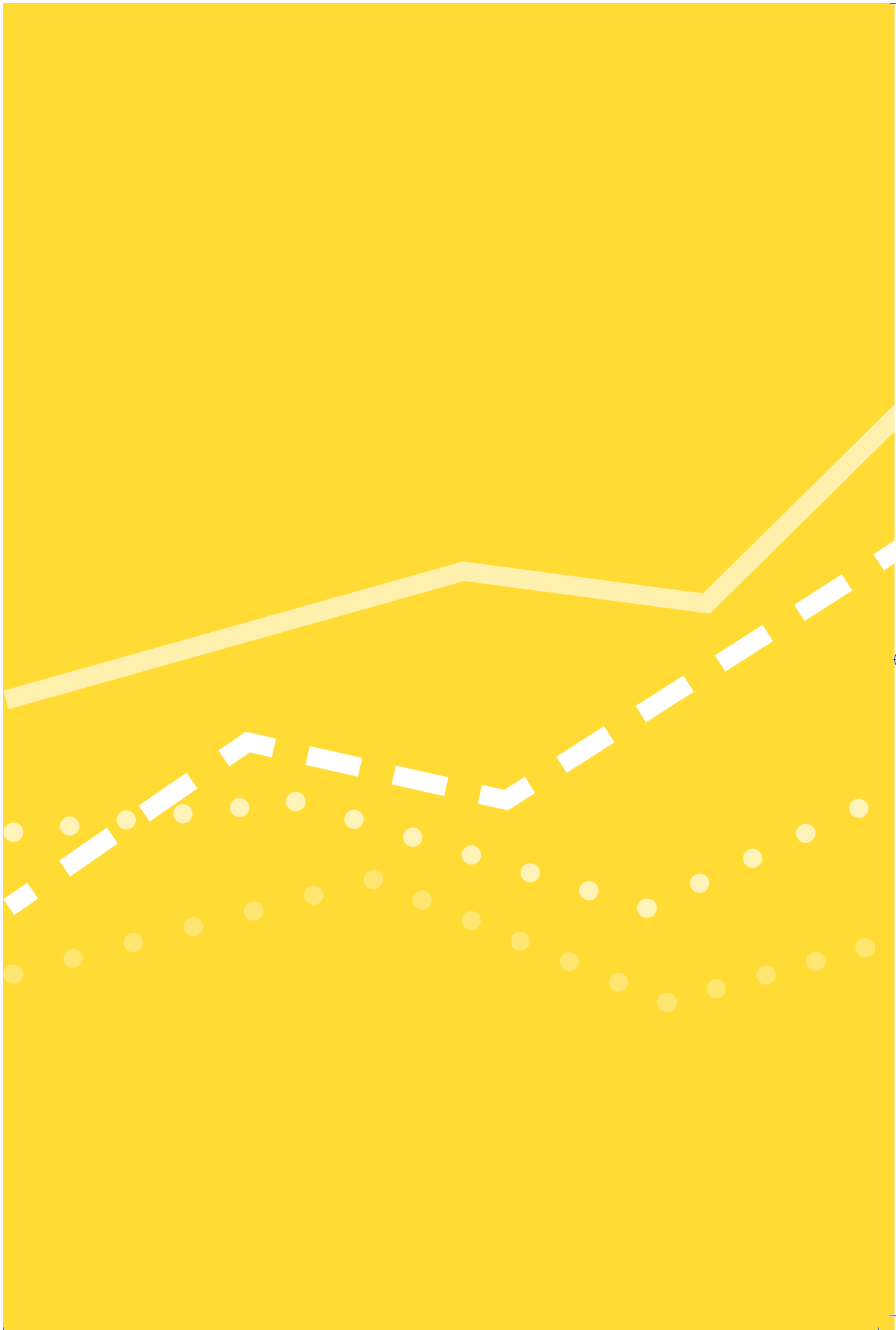
It is also important to recognise that treatment demand is not a direct indicator of the scale and nature of cannabis problems. General population survey data suggest that, compared with occasional use, intensive cannabis use is relatively uncommon. However, the widespread general use of cannabis means that considerable numbers of people may be using the drug intensively — at least for some part of their life (EMCDDA, 2004).

Although the effects of cannabis dependence or abuse are less severe than those of other drugs, this may, nevertheless, have a considerable public health impact. This is because of the scale of cannabis use, and the fact that many of those most affected are young and may be using the drug intensively during important developmental stages, or when they are particularly vulnerable. Among socially disadvantaged families or communities, cannabis dependence or abuse may compound individuals' problems by harming education or employment opportunities.

In summary, there remains a critical need for research to provide an understanding of the relationship between different patterns of cannabis use and the development of problems. The extent to which cannabis users experience problems and the nature of the problems that may be found still remain poorly understood. Methodological tools are required to assess problems at the population level. Such information is a prerequisite to the development, targeting and implementation of effective public health responses to cannabis use in Europe.

## References

- Agosti, V., Levin, F. R. (2004), 'Predictors of treatment contact among individuals with cannabis dependence', *The American Journal of Drug and Alcohol Abuse* 30: 121–127.
- DASIS (2003), 'Marijuana use secondary to other substances of abuse', *DASIS Report*, 11 April 2003, Substance Abuse and Mental Health Services Administration, Washington.
- DASIS (2005), 'Differences in marijuana admissions based on source of referral: 2002', *DASIS Report*, 24 June 2005, Substance Abuse and Mental Health Services Administration, Washington.
- DMRD (2004), 'Trends in treated problem cannabis use in the seven health board areas outside the Eastern Regional Health Authority, 1998 to 2002', *Occasional paper no. 14/2004*, Drug Misuse Research Division, Dublin.
- EMCDDA (2003a), *National Reports 2003*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2003b), 'Quality and Coverage of TDI and analysis of cannabis client profiles, 23–24 June 2003, 2003 Annual Expert meeting on TDI', *Meeting Report*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.  
[www.emcdda.eu.int/?nnodeid=1420](http://www.emcdda.eu.int/?nnodeid=1420)
- EMCDDA (2004), 'Cannabis problems in context — understanding the increase in European treatment demands', in EMCDDA (2004), *Annual report 2004*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2007a), *Annual report 2007*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2007b), *Statistical Bulletin 2007*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA and Pompidou Group (2000), *Treatment Demand Indicator; Standard Protocol Version 2.0*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.  
[www.emcdda.eu.int/?nnodeid=1420](http://www.emcdda.eu.int/?nnodeid=1420)
- Kraus, L., Augustin, R., Korf, D. et al. (2003), 'Cannabis use in France, Germany, Greece and Spain: has age of first use experience shifted towards younger age?' (unpublished report).
- LADIS (2004) 'Treatment demand of cannabis clients in outpatient addiction care in the Netherlands', *LADIS Bulletin*, April, Stichting IVZ, Houten.
- NSDUH (2004), 'Daily marijuana users', *NSDUH Report*, 26 November, Substance Abuse and Mental Health Services Administration, Washington.
- SAMHSA (2003), *Treatment Episode Data Set. Highlights 2003. National Admissions, to Substance Abuse Treatment Services*, Substance Abuse and Mental Health Services Administration, Washington.  
[www.dasis.samhsa.gov/teds03/2003\\_teds\\_highlights.pdf](http://www.dasis.samhsa.gov/teds03/2003_teds_highlights.pdf)
- Simon, R. (2004), 'Regular and intensive use of cannabis and related problems: conceptual framework and data analysis in the EU Member States', *Final Report*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.  
[www.emcdda.eu.int/?nnodeid=1420](http://www.emcdda.eu.int/?nnodeid=1420)
- Toxibase, CRIPS (2004), 'L'usage problématique de cannabis', *Toxibase*, 12/Lettre CRIPS n. 70, février 2004, Toxibase, Paris.







## Chapter 14

# Cannabis treatment in Europe: a survey of services

**Keywords:** cannabis – early intervention – psychosocial intervention – treatment provision

### Setting the context

Scientific literature on the treatment of cannabis-related disorders is scarce, particularly when compared with opioid treatment. While there have been some synthetic overviews (Hall et al., 2001; Steinberg et al., 2002; Loxley et al., 2004), analysis has generally been peripheral to wider works on cannabis or restricted to adolescents (e.g. SAMHSA's Cannabis Youth Treatment series in the USA; Elliott et al., 2002; Liddle et al., 2002).

Scarcity also seems to characterise research on the treatment of cannabis-related problems in the European Union. This could be explained by a common belief that cannabis problems are not a primary problem for people in drug treatment. Yet Europe, like the USA, is recording a trend in which cannabis is mentioned at an increasing rate in the context of treatment demand indicators (EMCDDA, 2004, 2006; UNODC, 2006). Another explanation is that cannabis does not produce the pharmacological dependence syndrome associated with alcohol, nicotine and opioid use. However, as the chapters by Witton and Hall in Volume 2 of this monograph indicate, somatic and mental problems related to cannabis use affect thousands of people.

Indications do, however, exist, which point towards new directions in regards to cannabis treatment. At the level of healthcare policy, domestic and international research, cannabis treatment has for some years been gaining a higher level of visibility and public funding. In July 2004, the European Council adopted a resolution on cannabis proposed by the *Horizontal Working Party on Drugs*, which called for the EMCDDA to continue to monitor 'conditions for effective prevention and treatment, and examples of best practice' and encourages Member States to 'promote networking'.

In many ways, EU-wide monitoring into cannabis treatment has already benefited from scientific collaboration, both in terms of defining a 'PCU' (problematic cannabis user) and establishing standard treatment indicators. In June 2003, EMCDDA hosted expert meetings on the 'Quality and coverage of TDI and analysis of cannabis client profiles' <sup>(1)</sup> and 'The profile of cannabis clients in different regions of the world' <sup>(2)</sup>. In parallel, the EMCDDA commissioned a report on 'Regular and intensive use of cannabis and related problems: conceptual framework and data analysis in the EU member states' (Simon, 2004). The Centre also published a selected issue, titled 'Cannabis problems in context: understanding the increase in European treatment demands' in its 2004 Annual Report (EMCDDA, 2004).

Supranational networking is taking place on a number of levels, and is increasingly crossing the linguistic barriers which have at times acted as an obstacle to collaboration. Cannabis is increasingly mentioned in EMCDDA's EDDRA <sup>(3)</sup> database, including specialised cannabis treatment in Lund, Sweden <sup>(4)</sup>, and Berlin, Germany <sup>(5)</sup>. A supranational project focused on adolescent therapy, INCANT (International Cannabis Need of Treatment Study) has completed pilot phases at centres in Belgium, Germany, France, the Netherlands and Switzerland, with the main phase being run from 2006 to 2009. Cannabis mental health issues and treatment options were covered in a 2006 Beckley Foundation report <sup>(6)</sup>. Meanwhile, recent forums for international research have included the annual HIT *Perspectives on cannabis* conference in the United Kingdom, Therapieladen's Cannabis — Quo vadis <sup>(7)</sup> conference in 2005 in Germany, not to mention cannabis presentations within general drug treatment conferences, such as ICTAB (the International Conference on Treatment of Addictive Behaviors). In terms of best practice, Germany's CaRED <sup>(8)</sup> project, managed from 2002 to 2004, represents a thorough analysis of cannabis treatment, albeit with a domestic focus, and in turn has helped stimulate innovative cannabis treatment provision studies, such as CANDIS <sup>(9)</sup>.

<sup>(1)</sup> [www.emcdda.europa.eu/?nnodeid=1861](http://www.emcdda.europa.eu/?nnodeid=1861)

<sup>(2)</sup> [www.emcdda.europa.eu/?nnodeid=1881](http://www.emcdda.europa.eu/?nnodeid=1881)

<sup>(3)</sup> [www.emcdda.europa.eu/themes/best-practice](http://www.emcdda.europa.eu/themes/best-practice)

<sup>(4)</sup> EDDRA link:

[www.emcdda.europa.eu/html.cfm/index52035EN.html?project\\_id=1293&tab=overview](http://www.emcdda.europa.eu/html.cfm/index52035EN.html?project_id=1293&tab=overview)

Home page: [www.drogeninfo.com/](http://www.drogeninfo.com/)

<sup>(5)</sup> EDDRA link:

[www.emcdda.europa.eu/html.cfm/index52035EN.html?project\\_id=2915&tab=overview](http://www.emcdda.europa.eu/html.cfm/index52035EN.html?project_id=2915&tab=overview)

Home page: [www.drogen-und-du.de](http://www.drogen-und-du.de)

<sup>(6)</sup> [www.internationaldrugpolicy.net/reports/BeckleyFoundation\\_Report\\_08.pdf](http://www.internationaldrugpolicy.net/reports/BeckleyFoundation_Report_08.pdf)

<sup>(7)</sup> [www.therapieladen.de/](http://www.therapieladen.de/)

<sup>(8)</sup> Simon, R., Sonntag, D. (2004), *Cannabisbezogene störungen: umfang, behandlungsbedarf und behandlungsangebot* [Cannabis-related disorders (CareD): prevalence, service needs and treatment provision], Bundesministerium für Gesundheit und soziale Sicherung, Munich [www.bmg.bund.de/nn\\_604826/SharedDocs/Download/DE/Themenschwerpunkte/Drogen-und-Sucht/Cannabis/cannabisbezogene-stoerungen,templateId=raw,property=publicationFile.pdf/cannabisbezogene-stoerungen.pdf](http://www.bmg.bund.de/nn_604826/SharedDocs/Download/DE/Themenschwerpunkte/Drogen-und-Sucht/Cannabis/cannabisbezogene-stoerungen,templateId=raw,property=publicationFile.pdf/cannabisbezogene-stoerungen.pdf)

<sup>(9)</sup> [www.candis-projekt.de/](http://www.candis-projekt.de/)





This chapter is based on a survey that answered the basic question: What type of treatment is available for cannabis use disorders in Europe today? While the results are not exhaustive, they help to inform the road ahead.

## Further reading

Copeland, J. (2004), 'Developments in the treatment of cannabis use disorder', *Current Opinion in Psychiatry* 17(3): 161–167.

EMCDDA, *Annual reports*, published each year in November.

UNODC and EMCDDA (2006), *Guidance for the measurement of drug treatment demand*, UNODC and EMCDDA, Vienna and Lisbon.

# Cannabis treatment in Europe: a survey of services

Sharon Rödner Sznitman

## Introduction

In response to an identified lack of data about cannabis treatment provision in Europe, the Centre for Social Research on Alcohol and Drugs (SoRAD), in cooperation with EMCDDA, conducted a survey on cannabis treatment provision in Europe in 2005. The study was designed to provide a base for a preliminary description of cannabis treatment in Europe, to examine the availability and nature of different specialist treatments for cannabis users, and to profile their clients' characteristics.

## Research method and sample design

The study was conducted in two phases. In phase I, key informants were contacted through the EMCDDA's coordinating network of national focal points. This provided access to informants from the 25 Member States and Norway; Switzerland also participated. A questionnaire was emailed to these informants in which they were asked to provide contact information for key position holders in treatment centres which are likely to see cannabis cases. Informants for phase II were thus identified and these were contacted by email.

The criterion for including a key expert in the study was 'any person who is a holder of a key position at any centre offering treatment for patients with cannabis use as the primary problem'. Respondents were asked to indicate whether their service treated cannabis as the primary drug problem but also included other drugs, or solely treated cannabis-related problems. The questionnaire asked for information regarding the particular treatment offered to the cannabis clients and for summary data on agency's clients.

## Problematic issues

Methodological limitations should be considered: since the survey was voluntary only some countries responded and they are not proportionately represented in the survey (e.g. Sweden returned eight questionnaires, Norway six, while some countries returned only one and others did not reply).



Over 100 questionnaires were sent out in Phase II of the survey, yet only 45 were returned. The results of the survey should, thus, be read with caution. They cannot claim to be representative of cannabis treatment in Europe overall. In the questionnaires, cannabis cases were defined as people who receive treatment mainly due to their cannabis use. This definition does not include polydrug users who use cannabis as a secondary drug together with other substances (e.g. heroin). The total number of people using cannabis is, therefore, underestimated.

## Important definitions

For the purposes of the survey a treatment programme for cannabis cases is defined as any treatment at the agency for persons who are receiving treatment primarily for problems related to their cannabis consumption. Cannabis cases are defined as persons who are enrolled at the agencies mainly for their cannabis consumption and do not include patients with, for instance, heroin problems who also use cannabis.

## Results

Responses were received from 45 individuals representing 45 different treatment agencies, from 19 EU Member States, Norway and Switzerland. Member States which did not respond and are hence not included in the study are: Estonia, Spain, Ireland, Slovenia, Luxembourg and the Netherlands. The respondents hold a wide range of positions in their treatment centres, including therapists, coordinators, heads of treatment centres, social workers, psychologists and nurses.

## Description of the treatment centres

The majority of the responding treatment centres deal with a range of drug-related problems, and most of the treatment centres were fairly large. Six centres saw under 100 clients per year. Twenty-one centres saw between 100 and 500 patients per year, with the remainder treating over 500 patients per year. The majority, 72% (31), of the centres treated all or many patients in outpatient ambulatory counselling settings. A total of 36% of the centres treated all or some of their patients in long-term inpatient treatment. Short-term, inpatient treatment, treatment in a day clinic or in the community was less common.

Table 1 reports respondents' rating of the importance of modalities provided by their service. Short-term psychosocial interventions, long-term psychosocial interventions and long-term rehabilitative drug therapy were seen as the most important. In addition, on-the-spot psychosocial crisis intervention was rated as a very important or important

Table 1: Key informant rating of the importance of the different tasks at the agencies

	<i>n</i>	1: very important task, % ( <i>n</i> )	2: important task, % ( <i>n</i> )	3: relatively unimportant task, % ( <i>n</i> )	4: no task at all/not on offer, % ( <i>n</i> )
a On-the-spot psychosocial crisis intervention	(42)	24 (10)	38 (16)	31 (13)	7 (3)
b Short-term psychosocial interventions: short-term counselling	(43)	41 (18)	52 (23)	7 (3)	0
c Long-term psychosocial interventions: long-term counselling	(45)	49 (22)	45 (20)	5 (2)	2 (1)
d Long-term rehabilitative drug therapy: long-term psychotherapy	(43)	40 (17)	42 (18)	7 (3)	12 (5)
e Medical intervention for somatic problems	(42)	12 (5)	26 (11)	29 (12)	33 (14)
f Detoxification	(42)	24 (10)	26 (11)	21 (9)	29 (12)
g Harm reduction (e.g. syringe exchange, educating safer-use strategies, etc.)	(42)	31 (13)	17 (7)	24 (10)	29 (12)
h Methadone or buprenorphine substitution	(43)	30 (13)	19 (8)	9 (4)	42 (18)
i Heroin prescription	(42)	2 (1)	0	0	98 (41)
j Naltrexone prescription	(41)	5 (2)	11 (5)	17 (7)	66 (27)

task by many informants. Fewer identified detoxification, harm reduction, medical intervention for somatic problems, methadone or buprenorphine substitution, heroin and naltrexone prescription as very important or important tasks of their agencies.

## Description of cannabis treatment

Although the recruitment strategy of the study attempted to ensure that questionnaires were sent to treatment agencies that include cannabis cases, four of the centres included in the study did not currently have any cannabis cases. Thus, the following results are based on only 41 treatment centres.



It is evident from the survey results that cannabis cases for the most part represented a minority of the overall clientele in the agencies. In 63% (25) of the centres cannabis cases represented 0–25% of the entire patient case load. Some centres did, however, seem to exclusively treat cannabis cases. In six centres (15%) — from Belgium, Denmark, Sweden, Cyprus and Germany — cannabis cases represented 75–100% of the patient case load.

Out of all the treatment centres, nine (23%) treated at least some of the cannabis cases in a programme within a unit not exclusively for cannabis cases. Fourteen centres (35%) treated the cannabis cases as individual cases among drug users of all sorts. Thus, it is evident that a substantial proportion of the agencies do not have a specific cannabis treatment programme. It is, however, also evident that treatment programmes exist which have an exclusive focus on cannabis cases. Six of the centres (15%) treated the cannabis cases in a unit exclusively for cannabis cases. Three of these were located in Sweden, and there was one such unit in each of Belgium, Germany and Italy.

Evidently, units exclusively for cannabis clients exist in Europe, but these must be regarded as a scarce phenomenon. This claim is further evidenced by the fact that only 10 of the respondents knew of only one treatment unit exclusively for cannabis in their city while three respondents reported that there were two such units in their city. One respondent reported that there were none and 14 respondents did not know how many there were.

## Treatment

Most of the treatment provided to cannabis cases lasts no longer than 20 sessions. Fifteen of the treatment centres treated cannabis cases on average in 1 to 10 treatment sessions. Fifteen centres treated the clients in 11 to 20 treatment sessions. Treatment over 20 sessions was rare. As such, current treatment seems to correspond well with the literature on evidence-based cannabis treatment. Although the literature is scarce, the few existing studies mainly indicate that the most useful treatment for cannabis users is brief intervention (Stephens et al., 2000; Babor et al., 2004).

The aims of cannabis treatment reported as very important by most of the agencies were abstinence (20 agencies, 50%) and reduction of cannabis use (19 agencies, 48%). Seven agencies (18%) reported harm reduction (e.g. solving practical life problems and no attempt to change cannabis consumption) as a very important aim. Quite a few agencies (15), however, reported that harm reduction was an important, but not a very important, aim of the cannabis treatment.

In terms of what type of treatment is offered to cannabis cases, there seems to be a wide range of interventions available. As Table 2 shows, the main treatments reported by most of the agencies were: individual counselling, talk therapy/counselling about cannabis, relapse and treatment, and talk therapy/counselling about conditions of life. Also a regular part of treatment in many agencies were detox<sup>(10)</sup> from cannabis, family therapy, therapeutic community<sup>(11)</sup> and mutual help groups.

**Table 2: Content breakdown of cannabis interventions, based on number of respondents reporting specific treatment types**

	<i>n</i>	1: main part of treatment, % ( <i>n</i> )	2: regular part of treatment, % ( <i>n</i> )	3: not a part of treatment, % ( <i>n</i> )
a Detox from cannabis	(41)	24 (10)	42 (17)	34 (14)
b Peer group counselling	(40)	13 (5)	24 (11)	77 (24)
c Individual counselling	(41)	78 (32)	22 (9)	0
d Family therapy/counselling	(41)	22 (9)	71 (29)	7 (3)
e Milieu therapy/therapeutic community	(37)	0	24 (9)	76 (28)
f Talk therapy/counselling about cannabis, relapse and treatment	(41)	73 (30)	24 (10)	2 (1)
g Talk therapy/counselling about conditions of life (relationship problems, aggression training, etc.)	(41)	63 (26)	37 (15)	0
h Practical help with daily life (to get social allowances, clothes, housing, education, job)	(40)	13 (5)	48 (19)	40 (16)
i In-patient treatment	(39)	8 (3)	21 (8)	72 (28)
j Mutual help group (e.g. Narcotics Anonymous)	(41)	0	15 (6)	85 (35)

<sup>(10)</sup> Detox refers to the process of abstinence to clear cannabis from the body, accompanied by social and environmental support during the associated physiological and psychological changes.

<sup>(11)</sup> Therapeutic community is a term applied to a participative, group-based approach to drug treatment that includes group psychotherapy and practical activities, and which may or may not be residential.

## Characteristics of cannabis cases

### Gender

As in drug treatment in general, cannabis cases are predominantly male. Only one treatment agency reported having less than 50% males. Four agencies reported only a slight male dominance (51–59% of all cannabis cases). Nine agencies reported that 60–69% were male, 13 agencies reported that 70–79% were male, 10 agencies reported that 80–89% were male and six agencies reported that 90–99% were male.

### Age

The majority of cannabis cases are fairly young. Sixteen agencies (39%) reported that all or the majority of their cannabis cases were 20 years old or younger. Thirteen agencies (32%) reported that all or the majority of their cannabis cases were between 21 and 30 years old. Only four (8%) of the agencies reported that the majority of their cannabis cases were over 30 years old.

### Referral channels

Worries have been expressed concerning increasing demand for cannabis treatment evident in many parts of the EU. It has, however, been pointed out that the rise might not be due to an increase in cannabis problems or dependence in the population. Instead, the rise might, among other things, be due to policy changes, which in turn lead to more referrals to treatment by police and school systems. While this study is unable to measure any trends over time, it provides indications of which are the most common referral channels to treatment for cannabis cases (Table 3).

The most common source of referrals reported was the client's family and friends. Many agencies also reported that self-referrals were most common. However, more agencies than not reported that cannabis clients do not enter treatment on their own initiative. Other referral sources were also reported; among them the most common were the criminal justice system, schools, psychiatrists, psychologists, social workers and general practitioners. It must, however, be noted that the separation between self-referrals and external referral channels is far from clear-cut. Research from Sweden, for instance, has shown that there is a large overlap between reporting self-motivation to treatment and reporting pressure from unofficial or official sources to enter treatment (Storbjörk, 2004).

Table 3: Reported common referral channels for cannabis cases

	<i>n</i>	1: most common, % ( <i>n</i> )	2: common, % ( <i>n</i> )	3: not at all common, % ( <i>n</i> )
a Self-referrals	(39)	31 (12)	33 (13)	36 (14)
b Client's/patient's family/friends	(39)	38 (15)	53 (21)	8 (3)
c School	(40)	8 (3)	40 (16)	52 (21)
d Work	(38)	3 (1)	18 (7)	80 (31)
e General practitioner (family doctors)	(41)	12 (5)	32 (13)	56 (23)
f Psychiatrist/psychologist/social worker (out-patient or private practice)	(39)	8 (3)	67 (26)	26 (10)
g Courts, probation, parole, police	(39)	18 (7)	41 (16)	41 (16)
h Drug counselling agency or drug treatment units	(40)	5 (2)	24 (11)	68 (27)

Twenty-eight respondents reported that 50% or more of the cannabis clients received treatment for their substance abuse for the first time in their life when they came into contact with the agency. In fact, as many as 12 respondents reported that 90% or more of their cannabis cases received help for their substance abuse for the first time.

## Lifestyles

Most cannabis cases in treatment had a socially well-integrated life before entering treatment. A large majority of the agencies reported that it was not at all common that the cannabis cases had been homeless or lived in a sheltered environment before entering treatment. The most common living conditions among the cannabis cases were living with parents or living alone.

A majority of the agencies reported that it was common that the cannabis cases had attended school or university or had been employed before entering treatment. There were, however, slightly more agencies that reported that it was common that cannabis cases were school drop-outs or unemployed prior to treatment.

In terms of mental well-being, less than a majority (30%) (Table 4) of the respondents reported that it was common that cannabis cases had psychiatric problems (based on



Table 4: Reported situations for cannabis treatment before entry to treatment

	<i>n</i>	1: most common, % ( <i>n</i> )	2: common, % ( <i>n</i> )	3: not at all common, % ( <i>n</i> )
a Were homeless	(41)	0	7 (3)	93 (38)
b Lived in a sheltered environment (e.g. home for psychiatric cases)	(41)	0	7 (3)	93 (38)
c Lived with their parent(s) or guardian(s)	(41)	46 (19)	46 (19)	7 (3)
d Lived alone	(40)	30 (12)	48 (19)	23 (9)
e Lived with friends	(40)	3 (1)	28 (11)	70 (28)
f Lived with their own family	(41)	10 (4)	49 (20)	42 (17)
g Went to school/ university	(41)	15 (6)	63 (26)	22 (9)
h Dropped out of school	(41)	7 (3)	73 (30)	20 (8)
i Worked	(41)	7 (3)	61 (25)	32 (13)
j Were unemployed	(41)	15 (6)	66 (27)	20 (8)
k Had psychiatric problems	(40)	23 (9)	30 (20)	28 (11)
l Had health problems	(41)	5 (2)	29 (12)	66 (27)
m Had problems with the criminal justice system	(40)	23 (9)	65 (26)	13 (5)
n Had family problems	(41)	42 (17)	59 (24)	0
o Had financial problems	(40)	15 (6)	58 (23)	28 (11)

an affirmative response 'had psychiatric problems' to the question 'According to your experience, how common are the following situations for cannabis cases before they enter treatment at your agency?'). Many agencies, but less than the majority, also reported that it was common for cannabis cases to have problems with the criminal justice system prior to treatment entry. Family problems were rated as common for cannabis clients by slightly more than half of the respondents. Lastly, most agencies (66%, see Table 4) reported that it was not at all common that the cannabis clients had health problems <sup>(12)</sup>.

<sup>(12)</sup> The questionnaire is annexed to this chapter.

## Cannabis use and polydrug use

The study shows that cannabis cases for the most part have been using cannabis for more than 5 years before entering treatment. Fifteen respondents (37%) reported that all or the majority of the cannabis cases had been using for 5 years or more before entering treatment. Nevertheless, cannabis use for less than 5 years was also reported. Two respondents reported that the majority of their cannabis cases had used cannabis for less than a year and seven respondents (22%) reported that half of their cannabis cases had used cannabis for this period.

In this study the respondents were asked to report on cannabis cases, meaning people in their agencies who received treatment mainly for their cannabis consumption. This does, however, not exclude the possibility that the cannabis cases also use other drugs. Indeed, as shown in the epidemiological section of this issue, polydrug use is far from the exception in regards to cannabis consumption (Table 5).

In terms of substance use other than cannabis, the majority of the respondents reported that heavy use of cigarettes (more than 20 per day) occurred very often among their cannabis cases. Heavy use of alcohol was reported very often by slightly fewer agencies. Only one respondent reported that heavy use of cigarettes never occurred, and no agency reported that heavy use of alcohol never occurred among their clients.

All other substances were reported as less often used. Cocaine, for instance, was reported as very often used by only two of the agencies. This substance was, however, reported as sometimes used by the majority of the agencies. Nine agencies also reported that cocaine was never used by the cannabis clients.

**Table 5: Reported level of other substance use than cannabis among the cannabis cases**

	<i>n</i>	1: very often used, % ( <i>n</i> )	2: sometimes used, % ( <i>n</i> )	3: never used, % ( <i>n</i> )
a Heavy use of alcohol	(38)	45 (18)	55 (20)	0
b Heavy use of cigarettes (more than 20 cigarettes per day)	(40)	63 (25)	35 (14)	3 (1)
c Cocaine	(40)	5 (2)	73 (29)	23 (9)
d Amphetamines	(40)	20 (8)	68 (27)	13 (5)
e Ecstasy/hallucinogens	(40)	15 (6)	80 (32)	5 (2)
f Heroin	(40)	8 (3)	50 (20)	43 (17)
g More than three different substances	(39)	8 (3)	64 (25)	28 (11)



Use of amphetamines, hallucinogens and ecstasy were also more often reported as sometimes used than very often used. A majority reported that amphetamines were sometimes used by the cannabis clients and almost all the agencies reported that hallucinogens and ecstasy were sometimes used by the cannabis clients. Also important to note is that five agencies reported that amphetamines were never used, and two agencies reported that hallucinogens and ecstasy were never used by the cannabis cases.

Heroin use seems to be less prevalent among the cannabis cases, but still a substantial part of cannabis users seems to use heroin sometimes. Half of the respondents reported that the substance was sometimes used by cannabis clients. Nevertheless, also a substantial amount reported that heroin was never used by the cannabis clients.

Evidently, cannabis users in treatment tend to be polydrug users, although 11 informants indicated that three or more different substances were never used at the same time.

## General trends in cannabis cases

According to the informants' evaluation, there has not been a decrease in cannabis cases in the agencies. Twenty-nine respondents (67%) reported that there had been an increase the last 5 years, and 14 respondents (33%) reported that there had been a stable number of cannabis cases in their agencies.

Thirty respondents (67%) reported that there had been policy changes in their country towards cannabis use during the previous 5 years. These changes were overall reported as an increasing treatment emphasis and less emphasis on punitive approaches to cannabis users. Eighteen respondents reported that there had been more emphasis on treatment for cannabis users. Sixteen respondents reported there had been more attention to cannabis in treatment agencies, while 14 respondents reported that there had been emphasis on less punitive approaches. The policy changes do not, however, seem to follow a clear-cut unidirectional trend across Europe. Nine of the respondents described the policy changes in terms of more emphasis on punitive approaches (including respondents from Belgium, the Czech Republic, Denmark, France, Latvia, Austria, Poland and Switzerland).

## Summary and conclusion

In this report, various themes in connection with cannabis treatment and cases in Europe have been discussed. Based on a small sample of treatment centres, this study is only meant to provide a few indicators concerning the current state of cannabis treatment in Europe, and the material is not suited for generalisations or comprehensive in-depth analysis.



Overall, it seems that specialised cannabis treatment is a rare phenomenon in Europe today. Of the 41 centres which had cannabis cases, 23 had no programme exclusively for them. Thus, it can be concluded that many cannabis cases across Europe are treated within the same setting as persons with other drug problems. This may be regarded as problematic, especially in view of the above findings which indicate that cannabis cases are relatively young. Research shows that much drug treatment is built for the adult population and does not thereby fit younger ages, and supporting material is often based on adult patterns of substance use (regular alcohol use, heroin, cocaine) rather than adolescent patterns (primary use of cannabis and alcohol bingeing). It is also based on adult experiences (parenting, health problems and adult dialogue examples) rather than adolescent experiences (peer pressure and adolescent dialogue examples) (Dennis et al., 2002a,b). Another problem which may arise when cannabis cases are placed in the same setting as other drug users is stigmatisation and exclusion (Sloboda, 1999).

While most people who use cannabis do not end up in treatment, there are those who do. Furthermore, it is evident that the demand for cannabis treatment is increasing. This may be due to any number of reasons: increased availability of treatment; an increased pressure to seek treatment; increased cannabis-related problems in the general population. Indeed, for the people who do end up in treatment it is not totally evident whether or not they actually have a cannabis problem. People might enter treatment due to pressures from friends, family or the criminal justice system. These complex issues are addressed in more detail by Simon (this monograph) but are also shortly touched upon in this study as the above findings indicate that there are many different referral channels of cannabis cases. Although there may be many cannabis cases that require treatment after awareness of personal cannabis problems, self-referral is not necessarily easily interpreted as such, as a person might seek treatment by himself after receiving demands from family, friends or the criminal justice system to do so.

Furthermore, it cannot be disregarded that increased cannabis treatment demand is an artefact of reporting measures. From this study, it is evident that polydrug use is common among cannabis cases, which is important in terms of how cannabis cases are registered. Indeed, since cannabis users also use other drugs, it cannot be discounted that the cannabis cases may have a complex substance use problem not derived solely from one substance. Many might be registered as cannabis cases, based on the criteria that cannabis is the drug used most frequently and most heavily. This criterion does, however, not exclude the possibility that they also receive or should receive treatment for other drug use.

According to the above results, cannabis treatment in Europe focuses on counselling about conditions in life in addition to counselling about cannabis use and relapse. Furthermore, a substantial proportion of the agencies reported that family therapy was





an important part of the treatment offered. In view of the heterogeneous make-up of cannabis cases, a variety of treatment offers is probably a useful approach, particularly as cannabis cases may have problems which are not directly related to cannabis use. Nevertheless, the effect of type of treatment offered should not be overemphasised. Indeed, as Bergmark (this monograph) highlights, there is no conclusive evidence for any specific treatment intervention for cannabis cases.

There are indications, on the other hand, that anything works, that the context of treatment and the individual's choice to enter treatment is important to treatment outcome. A summary of cannabis treatment studies by the Beckley Foundation notes that the effectiveness of cannabis treatment is not yet clear, but that there is growing evidence that it may fulfil a useful role (Hunt et al., 2006). The report further remarks that there is evidence which notes that there may be reason to move towards individual and targeted treatment through focusing on 'high risk' groups and even genetic screening. Indeed, it is a seductive idea that screening and targeting individuals may create cannabis treatment effectiveness. In light of the above result, and in light of the scarce available information, it does, however, seem that individualised solutions is a simplistic way forward that overlooks the complicated horizon related to cannabis treatment indicators, embedded in societal disapproval, in criminalisation of cannabis use, polydrug use and the highly heterogeneous make-up of the relevant clientele. In sum, this report, together with other evidence, suggests that our current understanding of and available cannabis treatment is scarce and a much more in-depth understanding of the relevant issues is needed.

## Acknowledgement

Special thanks to the national focal points who facilitated contact information, and the respondents.

## Bibliography

*Action plan on cannabis research 2003–2006* — Résumé issued 9 December 2003.

Babor, T. F. and the Marijuana Treatment Project Research Group (2004), 'Brief treatments for cannabis dependence: findings from a randomized multisite trial', *Journal of Consulting and Clinical Psychology* 72(3): 455–466.

*Cannabis 2002 Report*, Ministry of Public Health of Belgium, Brussels.

Copeland, J. (2004), 'Developments in the treatment of cannabis use disorder', *Current Opinion in Psychiatry* 17(3): 161–168  
[www.medscape.com/viewarticle473553](http://www.medscape.com/viewarticle473553)

Council Resolution on Cannabis. Issued in Brussels, Belgium, 7 July 2004. *Cordroque* 59. Reference number 11267/04.

Denis, C., Lavie, E., Fatsias, M., Auriacombe, M. (2005), 'Psychosocial interventions for cannabis abuse or dependence in outpatients settings', in *Cochrane Cannabis Protocol*.

- Dennis, M. L., Babor, T. F., Roebuck, C. M., Donaldson, J. (2002a), 'Changing the focus: the case for recognising and treating cannabis use disorders', *Addiction* 97(Suppl. 1): 4–15.
- Dennis, M. L., Titus, J. C., Diamond, G., Donaldson, J., Godley, S. H., Tims, F. M., Webb, C., Kaminer, Y., Babor, T., Roebuck, M. C., Godley, M. D., Hamilton, N., Liddle, H., Scott, C., 'The CYT Steering Committee (2002b), The Cannabis Youth Treatment (CYT) experience: rationale, study design and analysis plans', *Addiction* 97(Suppl. 1): 16–34.
- EDDRA projects available at <http://eddra.emcdda.eu.int/>
- Elliott, L., Orr, L., Watson, L., Jackson, A. (2002), *Drug treatment services for young people: a systematic review of effectiveness and the legal framework*, Effective Interventions Unit, Substance Misuse Division, Scottish Executive, Edinburgh.
- EMCDDA, *Annual report 1999, 2002, 2004 and 2006*.
- EMCDDA (2004), *Annual report: selected issues*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EU Drugs Action Plan (2000–2004).
- EU Drugs Action Plan (2005–2008).
- Fran, M. T., Dennis, M. L., Hamilton, N., Buchan, B. J., Diamond, G., Funk, R., Brantely, L. B. (1997), 'Characteristics and problems of 600 adolescents cannabis abusers in outpatient treatment', *Addiction* 97(Suppl. 1): 46–57.
- Hall, W., Degenhardt, L., Lynskey, M. (2001), *The health and psychological effects of cannabis — 2nd edition*, Monograph No. 44, Australian National Drug Strategy, Canberra.
- Hunt, N., Lenton, S., Witton, J. (2006), *Cannabis and mental health: responses to the emerging evidence*, Drug Policy Programme, Report 8, The Beckley Foundation, Oxford.
- Liddle, H., Rowe, C., Quille, T., Dakof, G., Sakran, E., Biaggi, H. (2002), 'Transporting a research-developed adolescent drug abuse treatment into practice', *Journal of Substance Abuse Treatment, Special Edition on Transferring Research to Practice* (ed. Simpson, D.), 22: 231–243.
- Loxley W., Toumboouro, J., Stockwell, T., Haines, B., Scott, K., Godfrey, C., Waters, E., Patton, G., Fordham, R., Gray, D., Marshall, J., Saggars, S., Williams, J. (2004), *The prevention of substance use, risk and harm in Australia: a review of the evidence*. Australian Government Department of Health and Ageing, Canberra.
- McRae, A. L., Budney, A. J., Brady, K. T. (2003), 'Treatment of marijuana dependence: a review of the literature', *Journal of Substance Abuse Treatment* 24(4): 369–376.
- Newcomb, M. D. (1995), 'Identifying high-risk youth: prevalence and patterns of adolescent drug abuse' in Rahdert, E. R., Czechowicz, D. (eds), *Adolescents drug abuse: clinical assessment and therapeutic interventions*, NIH Publication 95-3908, NIDA Research Monograph 156, National Institute on Drug Abuse, Bethesda, Maryland, 7–38.
- Simon, R., Sonntag, Bühringer, D., Kraus, L. (2004a), Cannabisbezogene Störungen: Umfang, Behandlungsbedarf und Behandlungsangebot in Deutschland [Cannabis related disorders (CaRED): prevalence, treatment needs and provisions services in Germany], Die Drogenbeauftragte der Bundesregierung, München.
- Simon, R. (2004), 'Regular and intensive use of cannabis and related problems: conceptual framework and data analysis in the EU Member States', European Monitoring Centre for Drugs and Drug Addiction  
[www.emcdda.europa.eu/index.cfm?fuseaction=public.AttachmentDownload&nNodeID=6443&languageISO=EN](http://www.emcdda.europa.eu/index.cfm?fuseaction=public.AttachmentDownload&nNodeID=6443&languageISO=EN)
- Sloboda, Z. (1999), 'Problems for the future? Drug use among vulnerable groups of young people', *Drugs: Education, Prevention and Policy* 6(2): 195–201.
- Steinberg, K., Roffman, R., Carroll, K., Kabela, E., Kadden, R., Miller, M., Duresky, D. (2002), The Marijuana Treatment Project Research Group, 'Tailoring cannabis dependence treatment for a diverse population', *Addiction* 97(1): 135.



- Stephens, R., Roffman, R., Curtin, L. (2000), 'Comparison of extended versus brief treatment for cannabis use', *Journal of Consulting and Clinical Psychology* 68(5): 598–908.
- Storbjörk, J. (2004), Why do alcohol and drug abusers enter treatment? The interplay between pressures from others and self-choice. Presented at the annual meeting of the Kettil Bruun Society, Helsinki, June.
- UNODC (2006), *World drugs report*, United Nations Office on Drugs and Crime, Vienna.

## Questionnaire

### Section A: Information on the agency and key-informant

In this section we would like to ask you some questions about your agency, and yourself and your position in the agency.

- A1 Please give your agency's name and address.
- A2 Please give your position in the agency.
- A3 What is your profession?
- a Nurse
  - b Social worker/youth worker
  - c Clinical psychologist
  - d Psychiatrist
  - e Other medical doctor
  - f Other (please specify): \_\_\_\_\_

### Section B: Information on the treatment programmes

In this section we would like to get information on the structure and the type of treatment agency you are working in.

- B1 How many patients/clients does your agency treat? You can answer this in whichever way you have the data:
- a Number of 'active' patients/clients (currently in a treatment episode)
  - b Number of patients/clients seen in a week
  - c Number of patients/clients seen in a 12-month period
- B2 How many of the patients/clients at your agency do you treat in one of the following settings? Please tick off for each setting.

	1: All	2: Many but not all	3: Approximately half	4: A few	5: None
a In the field (e.g. street work, prison work)					
b Ambulatory (e.g. outpatient, ambulatory counselling)					
c Day clinic (at least 3 hours per visit)					
d Short-term inpatient ( $\leq 1$ month)					
e Long-term inpatient ( $> 1$ month)					
f Other (please specify) _____					



B3 Please specify the importance of the different tasks at your agency. Please tick off for each task.

	1: Very important task	2: Important task	3: Relatively unimportant task	4: No task at all/not on offer
a On-the-spot psychosocial crisis intervention				
b Short-term psychosocial interventions: short-term counselling				
c Long-term psychosocial interventions: long-term counselling				
d Long-term rehabilitative drug therapy: long-term psychotherapy				
e Medical intervention for somatic problems				
f Detoxification				
g Harm reduction (e.g. syringe exchange, educating safer-use strategies, etc.)				
h Methadone or buprenorphine substitution				
i Heroin prescription				
j Naltrexone prescription				
k Other (please specify)_____				

### Section C: Information on cannabis treatment

In this section we would like to get information on treatment programmes for cannabis cases at your treatment centre. A *treatment programme for cannabis cases* is defined as any treatment at your agency directed towards persons who are receiving treatment first of all for their cannabis consumption. By *cannabis cases* we mean persons who are enrolled at your agency mainly for their cannabis consumption. Hence, we do not want you to include patients with, for instance, heroin abuse problems who also use cannabis.

C1a At your treatment centre, are there currently any cannabis cases?

Yes

No

C1b *If no*, please jump to section E of the questionnaire. *If yes*, please proceed to the next question.



Cannabis treatment in Europe: a survey of services

C2 Approximately what proportion of the patient case load at your agency are cannabis cases?

- a 0–10%
- b 11–25%
- c 26–50%
- d 51–75%
- e 76–100%

C3 In which setting(s) are cannabis cases at your agency treated? *More than one option is possible.*

- a In a unit/service exclusively for cannabis cases
- b In a programme within a unit not exclusively for cannabis cases
- c As individual cases among drug users of all sorts
- d Other (please specify) \_\_\_\_\_

C4 What is the average number of treatment sessions that cannabis cases at your treatment centre attend in the course of a treatment episode?  
\_\_\_\_\_sessions per client/patient

C5 What are the aims for treatment of cannabis cases at your agency? *Please tick off one box for each aim.*

	1: very important aim	2: important aim	3: relatively unimportant aim	4: no aim at all
a Abstinence				
b Reduction of cannabis use				
c Harm reduction or solving practical life problems (no attempt to change cannabis consumption)				
d Other (please specify) _____				

C6 To what extent does the treatment centre emphasise the following interventions for cannabis cases? *Please tick off for each intervention.*

	1: Main part of treatment	2: Regular part of treatment	3: Not a part of treatment
a Detox from cannabis			
b Peer group counselling			
c Individual counselling			
d Family therapy/counselling			
e Milieu therapy/therapeutic community			
f Talk therapy/counselling about cannabis, relapse and treatment			
g Talk therapy/counselling about conditions of life (relationship problems, aggression training, etc.)			
h Practical help with daily life (to get social allowances, clothes, housing, education, job)			
i In-patient treatment			
j Mutual help group (e.g. Narcotics Anonymous)			
k Other (please specify) _____			

### Section D: Information on the 'typical' cannabis case

In this section we wish to obtain information about how your typical cannabis cases can be characterised.

D1 What is typically the percentage of males among cannabis cases at your agency?

Male: \_\_\_\_\_ %

D2 According to your experience, how many cannabis cases are receiving help for their substance use for the first time in their life when they come in contact with your agency?

\_\_\_\_\_ % of cannabis cases treated in our agency.

D3 How many of the cannabis cases at your agency...

1: All      2: Majority    3: Half      4: Minority    5: None

- a Are 20 years old or younger?
- b Are between 21 and 30 years old?
- c Are 31 years old or older?
- d Have been using cannabis for less than a year?
- e Have been using cannabis for 5 years or longer?

D4 Typically, how common is it that the cannabis cases are referred from the following sources? *Please tick off for each source.*

1: Most common    2: Common      3: Not at all common

- a Self-referral
- b Client's/patient's family/friend
- c School
- d Work
- e General practitioner (family doctor)
- f Psychiatrist/psychologist/social worker (out-patient or private practice)
- g Courts, probation, parole, police
- h Drug counselling agency or drug treatment unit
- i Other (please specify)\_\_\_\_\_

D5 According to your experience, how common are the following situations for cannabis cases before they enter treatment at your agency? *Please tick off for each situation.*

	1: Most common	2: Common	3: Not at all common
a Were homeless			
b Lived in a sheltered environment (e.g. home for psychiatric cases)			
c Lived with their parent(s) or guardian(s)			
d Lived alone			
e Lived with friends			
f Lived with their own family			
g Went to school/university			
h Dropped out of school			
i Worked			
j Were unemployed			
k Had psychiatric problems			
l Had health problems			
m Had problems with the criminal justice system			
n Had family problems			
o Had financial problems			

D6 Apart from cannabis, what are the most often used substances by cannabis cases? *Please tick off for each substance.*

	1: Very often used	2: Sometimes used	3: Never used
a Heavy use of alcohol			
b Heavy use of cigarettes (more than 20 cigarettes per day)			
c Cocaine			
d Amphetamines			
e Ecstasy/hallucinogens			
f Heroin			
g More than three different substances			
h Other substances			

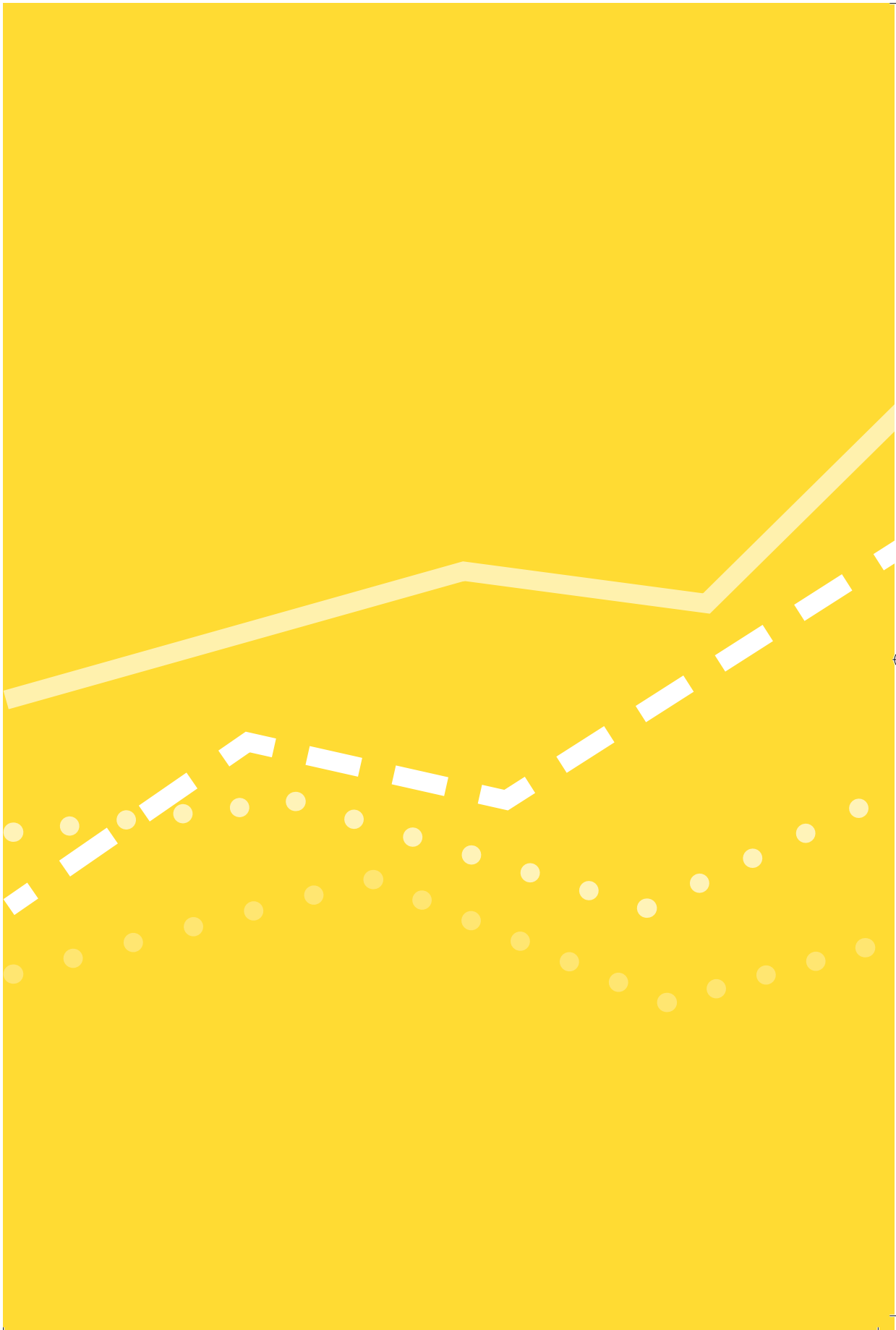


## Section E: Information on general cannabis-related trends

In this section we would like to obtain more general information related to cannabis than the above sections.

- E1a According to your knowledge, how many units exclusively for cannabis cases are there in your city?  
\_\_\_\_\_(enter number)
- E1b Please guess how many cannabis cases they treat altogether at one time.  
\_\_\_\_\_ per week  
I cannot even guess
- E2 Please provide contact information for one or two other centres in your country that treat cannabis cases.
- E3 Please evaluate the trend over the last 5 years. In regard to your agency, has there been:
- a An increase in numbers of cannabis cases
  - b Stable numbers of cannabis cases
  - c A decrease in numbers of cannabis cases
- E4a Please evaluate the trend over the last 5 years. In your country, has there been any policy change towards cannabis use?  
Yes  
No
- E4b *If yes, which of the following options best describe the change? More than one option is possible.*
- a More emphasis on treatment for cannabis users
  - b Less emphasis on treatment for cannabis users
  - c More emphasis on punitive approaches towards cannabis users
  - d Less emphasis on punitive approaches towards cannabis users
  - e More attention to cannabis in treatment agencies
  - f Less attention to cannabis in treatment agencies
- E5 In your opinion, which alterations or developments would be desirable for a better treatment of your cannabis cases?
- E6 We would be grateful for any further comments or observations. If you have any please indicate them below.











## Chapter 15

# Has treatment demand for cannabis-related disorders increased in Germany?

**Keywords:** cannabis – epidemiology – Germany – treatment – treatment demand

### Setting the context

In Europe around 65 000 treatment demands were reported in 2005 where cannabis was cited as the primary reason for entering treatment (!). Cannabis use is the primary reason for entering drug treatment in about 20% of all cases and 29% of new treatment demands, making it the next most commonly reported drug in European treatment centres, after heroin. There are interesting variations between countries, with cannabis being cited by less than 5% of all clients reported as entering treatment in Bulgaria, Lithuania, Poland and Romania and by more than 30% in Hungary and France. For the remaining countries, in 12 European countries, the proportion of cannabis clients is between 5 and 20% and in seven it is between 21 and 29% (EMCDDA, 2007).

What has fuelled anxiety among policymakers is not that treatment demands are unmanageable. A figure of 65 000 treatment demands is a relatively small proportion of current cannabis users (13.4 million last month cannabis users in Europe), amounting to less than one in every 200 last month cannabis users. Moreover, the risk of entering treatment would seem to increase as cannabis use becomes more intensive. Cannabis clients in treatment in Europe can be divided into three groups: those who use it occasionally (34%), those using it once to several times a week (27%) and those using it daily (39%). On a more general level, the 65 000 cannabis treatment demands may be compared with the 130 000 treatment demands for opioid use, from an estimated population of 1.3–1.7 million problem drug users in Europe: a demand rate of approximately 1 in 10. Additionally, given the resource-intensive treatment required by opioid clients, as opposed to the outpatient/short intervention norm for cannabis (see Rödner Sznitman, this monograph), it is clear that drug treatment should reflect the proportional risks of different licit and illicit substances.

(!) Source: EMCDDA Statistical Bulletin 2007. Data available from 21 countries.



## Has treatment demand for cannabis-related disorders increased in Germany?

That said, a worrying trend is that, between 1999 and 2005, the total numbers of both new and all reported cannabis treatment demands in Europe have approximately trebled. And while the most recent data suggest that this trend may be stabilising in some countries, the fact remains that an increasing number of cannabis clients are entering drug treatment services. While cannabis-specific treatment options are available in Europe today, many drug treatment services have been developed to target 'problem drug users'; that is, those injecting opioids or reporting long-term dependence with amphetamines, crack and cocaine. The surge in demand for cannabis treatment thus implies a need to develop or adapt existing services towards cannabis client profiles (see Montanari, Griffiths and Taylor, this monograph).

The rise in treatment demands is not easy to explain on a European level. Nonetheless, some countries have sought to examine, and re-examine, the nature of cannabis treatment demand in more detail. One of these countries is Germany. This chapter suggests that the reported 500% increase in cannabis treatment demand between 1992 and 2003 in Germany reflects a genuine increase in clinically diagnosable cases of cannabis use disorders. Alternative hypotheses to explain a rise in treatment demand — which might have included changing drug policy priorities, misdiagnosis, 'coercion' into treatment via referrals, new reporting mechanisms and data collection — were not considered significant. The chapter also reveals the type of problems experienced by those in treatment for cannabis problems in Germany.

Such a far-reaching 'revisit' of treatment demand data is useful for building a clearer picture of treatment populations, for validating results, for challenging assumptions and for checking the quality of data. One cause for optimism is that such 'deep', secondary analyses of treatment demand are increasingly common across Europe, enabling higher responsiveness to changing drug consumption patterns, both for cannabis and other drugs.

## Further reading

- EELDA (2006–2007), EELDA cannabis treatment section, evidence-based electronic library for drugs and addiction  
<http://en.eelda.org/index.aspx?o=1028>
- Elliott, L., Orr, L., Watson, L. and Jackson, A. (2002), *Drug treatment services for young people: a systematic review of effectiveness and the legal framework*, Effective Interventions Unit, Scottish Executive Drug Misuse Research Programme, Edinburgh.
- EMCDDA (2004), *Annual report 2004, Selected issue: Cannabis problems in context: understanding the increase in European treatment demands*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2007), *Annual report 2007*, Chapter 3: 'Cannabis', European Monitoring Centre for Drugs and Drug Addiction, Lisbon.





- Hall, W., Degenhardt, L., Lynskey, M. (2001), *The health and psychological effects of cannabis use*, National Drug Strategy, Canberra.
- Loxley, W., Toumbourou, J. W., Stockwell, T., Haines, B., Scott, K., Godfrey, C., Waters, E., Patton, G., Fordham, R., Gray, D., Marshall, J., Ryder, D., Sagggers, S., Sanci, L., Williams, J. (2004), *The prevention of substance use, risk and harm in Australia: a review of the evidence*, Commonwealth of Australia, Canberra, 163.
- Mental Health Council of Australia (2006), 'Preventing and treating co-occurring cannabis abuse and mental illness', Chapter 7 in *Where there's smoke... Cannabis and Mental Health*, Mental Health Council of Australia, Deakin.
- Obradovic, I. (2006), *Consultations cannabis: Enquête sur les personnes accueillies en 2005*, OFDT, St Denis.
- Ramos Atance, J. (ed.) (2007), *Aspectos psiquiátricos del consumo del cannabis*, Sociedad Española de investigación en cannabinoides (SEIC), Madrid.
- Steinberg, K. L., Roffman, R. A., Carroll, K. M., Kabela, E., Kadden, R., Miller, M., Duresky, D. and the Marijuana Treatment Project Research Group. (2002), 'Tailoring cannabis dependence treatment for a diverse population', *Addiction* 97(1): 135–142.

See also the grey literature list in the Appendix to Volume 1 of this monograph.



# Has treatment demand for cannabis-related disorders increased in Germany?

**Roland Simon and Ludwig Kraus**

## Summary

First indications in Germany suggested an increase in treatment demand for primary cannabis-related problems. These led the German National Addiction Aid Statistics (DSHS) and a research study (CARED) to analyse treatment demands. The results showed an increase of roughly 500% in treatment admissions in outpatient treatment for this group in Germany between 1992 and 2003. Three-quarters of these cases fulfilled the clinical criteria of a cannabis-related disorder as defined by ICD-10 (F12.1, F12.2x). The remaining cases did not reach this level of clinical significance, but might indicate minor cannabis-related problems. Where multiple diagnoses exist, no indication was found that cannabis was assigned as primary drug incorrectly. As the increase in treatment admissions was similar for most types of referrals, changes in treatment admissions were very likely not caused by changing treatment availability or external pressure but by a genuine increase in treatment need. While last year prevalence of cannabis use increased considerably in the population between 1992 and 2003, treatment admissions in outpatient centres grew even faster, and it will be necessary to adapt the treatment system in Germany to this increasing group of clients.

## Introduction

While for decades cannabis use has not been perceived as a problem by many addiction therapists and researchers, recent results from basic research as well as from clinical and social epidemiology support a more cautious position, which assumes a higher risk potential of cannabis, at least for some subgroups of users (Hall and Solowij, 1997; INSERM 2001; Witton, this monograph, vol. 2). Hall, Degenhardt and Teesson (2004), for example, reported that while there is no support for the hypothesis that cannabis causes psychotic disorders, there is evidence that cannabis use can precipitate schizophrenia and that cannabis use exacerbates psychoses. Patton et al. (2002) found a fourfold increase in the risk of depression and anxiety disorders among girls using cannabis on a daily basis.

First indications that outpatient treatment demands for primary cannabis-related problems might increase were reported by the German National Addiction Aid Statistics

(DSHS) in 2000 (Welsch, 2001). An increase in treatment demand could reflect the parallel rise in treatment need resulting from an increase in cannabis use as reported by population surveys (Kraus, Augustin and Orth, 2005). It is well known that drug treatment in Germany primarily focuses on injecting heroin users. Changes in treatment needs for cannabis-related problems would, therefore, require modifications in the type and organisation of treatment services provided. Increases in treatment demands within this group would also have implications for cannabis policy.

A number of possible factors that may have influenced treatment statistics were analysed to validate the assumption of a genuine and not artificial increase in treatment demand for cannabis-related disorders in outpatient care. The data analysed were derived from the DSHS, results from a recent epidemiological survey (Kraus and Augustin, 2005) and from a study on cannabis-related disorders (CARED), conducted between 2001 and 2004 (Simon et al., 2004). Artificial effects might have arisen from invalid diagnoses assigned by therapists in their daily work. As most of the staff have social work or psychology as a professional background, but no medical training, incorrect diagnoses might be assigned to clients. Other external factors might have explained the increase in treatment demand, such as increases in availability or accessibility of treatment, or increased judicial referrals into treatment. The main questions to be addressed were:

- Had there been an increase in treatment demand for primary cannabis-related problems?
- Were diagnoses for cannabis-related problems valid?
- Were there other external or confounding factors that could have caused the observed increase?
- How was the increase in treatment demand related to drug use trends in the population?

## Methodology

### German Addiction Aid Statistics (DSHS)

In Germany, national monitoring of drug treatment is based on the German core item set (Kerndatensatz, referred to below as 'KDS'). Within the 'client and treatment' module, the complete set of items from the EMCDDA's treatment demand indicator (TDI) protocol are used (EMCDDA, 2000). Drug use is assessed on the basis of ICD-10 criteria (WHO, 1994). Under the KDS, diagnoses can be made for each psychoactive substance (ICD-10, F10–F18), provided the criteria of harmful use or dependence syndrome are fulfilled. In case of multiple diagnoses the diagnosis related to the drug that causes the most severe problems ('primary drug') is selected as the 'main diagnosis'. The choice of diagnosis must be based on the intensity and frequency of use of the drug as well as on its negative consequences. Full operationalisation of such classifications, however, is



## Has treatment demand for cannabis-related disorders increased in Germany?

not part of the KDS standards. In addition, for the classification of clients the code F19.x (multiple drug use) was generally avoided in the German monitoring system when the study took place.

Aggregate data from the treatment centres are collected on an annual basis and were reported by the German Addiction Aid Statistics (DSHS) for the years 2001 to 2003 (Welsch, 2002; Welsch and Sonntag, 2003, 2004), while EBIS statistics were reported for the years before 1999 (e.g. Türk and Welsch, 2000). Analysis started in 1992 because changes in classification of disorders and substances were introduced in that year. In addition, data from the new Länder<sup>(?)</sup> of the former German Democratic Republic were included in the common statistics from 1992 onwards, making comparisons with data from earlier years impossible.

## The CARED study

The study on cannabis-related disorders (CARED) was conducted in a random sample of 52 outpatient treatment centres participating in the DSHS. All of them used a common technical system for data collection (EBIS). All clients ( $n = 223$ ), who had been treated in these centres during the year 2001 and who fulfilled the criteria of a 'cannabis client' (referred to below as 'CC'), were included in a paper-based retrospective survey. Inclusion criteria were:

- 1 A diagnosis of 'harmful use' or 'dependence syndrome' related to cannabis (ICD-10, F12.1 or F12.2) provided by the DSHS
- 2 Cannabis being the only or the primary drug ('main diagnosis').

A second group ( $n = 51$ ) of 'cannabis clients' (CCs), who had been in treatment between December 2002 and October 2003 in the same units, was assessed during treatment using a computer-based clinical interview. Diagnoses were based on ICD-10 and DSM-IV as assessed by DIA-X (Wittchen and Pfister, 1997). The participation rate in the first group was 40%. For the second group a rate could not be calculated as the total number of cannabis clients in treatment during this time period had not been reported by the treatment facilities. As part of the CARED study, therapists ( $n = 183$ ) from the participating centres were also asked in a questionnaire about details of the process of assigning diagnoses and their experience with cannabis clients.

<sup>(?)</sup> Germany is divided into 16 federal states, or *Bundesländer*. The six Länder of the former East Germany that joined in 1990 are Berlin, Brandenburg, Mecklenburg-Vorpommern, Sachsen, Sachsen-Anhalt and Thüringen.

## Results

### Increase in treatment admissions

The absolute number of clients starting outpatient treatment with a primary cannabis-related problem (CCs) was examined for the years 1992–2003, as well as the proportion of this group among the total group of clients. In 2003, 699 treatment centres reported main diagnoses for 106 816 clients to the national treatment monitoring system (DSHS), of whom 10 169 or 9.5% were diagnosed as CCs. This group comes third behind alcohol (59.6%) and opiates (19.8%). The absolute number of CCs increased over this 12-year period and the proportion within the treated clients reached 9.5%, starting at only 2.1% in 1992 (Table 1).

Participation in the DSHS being voluntary, the number of reporting facilities varied over time, ranging from 170 in 1992 to 699 in 2003. In order to make absolute numbers of cases comparable between reporting years, the number of clients reported was extrapolated to the total number of 1 049 outpatient treatment centres in Germany as reported for 2001 (Bundesministerium für Gesundheit, 2002) <sup>(3)</sup>.

The estimated total numbers of admissions for all outpatient treatment centres in Germany show an increase in CCs of nearly 600% between 1992 ( $n = 2\,561$ ) and 2003 ( $n = 15\,261$ ). A breakdown by gender, which was possible for the years 1999–2003, indicates similar developments for male and female clients. The proportion of women among CCs increased slightly from 16.8% in 1999 to 18% in 2003 (Figure 1). Thus, between 1992 and 2003 a clear increase in total treatment admissions was found in Germany for clients with a primary cannabis-related problem.

<sup>(3)</sup> Two limitations need to be mentioned with regard to the calculations. The total number of facilities only includes units which are financially supported by the Länder, which results in an underestimation of total demand for Germany as a whole. The majority of units in Germany, however, are funded by the Länder (Welsch and Sonntag, 2004) and, thus, the resulting total should not be significantly below the real number of CCs. In the same way, using the number of units for 2001 as an estimated total, as opposed to the annual figures, might cause errors. Exact data were available only for the years 1996–2003. Inspection of this period shows no major trend in number of reporting units and, apart from the year 2002, the totals range between 951 and 1 049 units. No general legal or financial changes took place during this period that might have changed the number of treatment units. Given all these facts, the number of facilities in 2001 may serve as a proxy for this calculation.

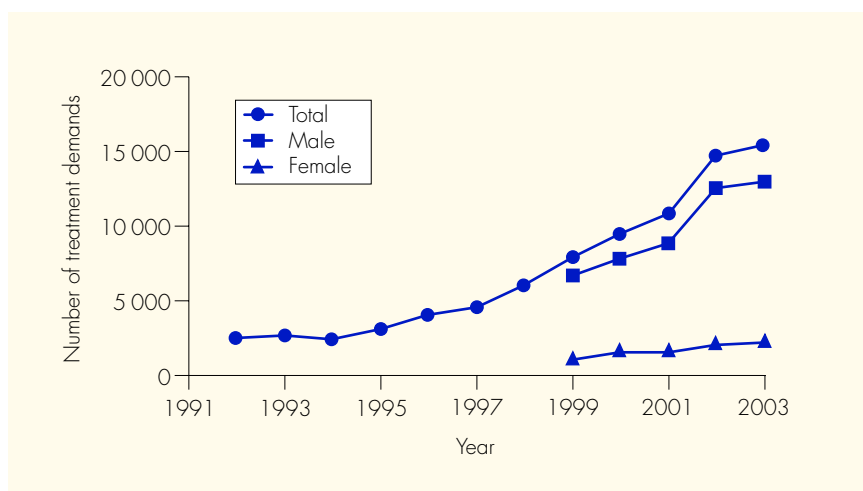
**Table 1: Number and proportion of cannabis clients within outpatient treatment: admissions 1992–2003 reported by participating centres**

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total number	19980	34344	49577	57712	57252	58642	64201	65910	57621	51842	73897	106816
Cannabis clients												
Number	415	709	1028	1368	1281	1977	2623	3343	3625	3700	6368	10169
%	2.1	2.1	2.1	2.4	2.2	3.4	4.1	5.1	6.3	7.1	8.6	9.5
Number of reporting centres	170	282	396	459	432	435	461	446	401	368	454	699

Sources: EBIS reports 1994–2001 (Türk and Welsch, 2000); German Addiction Aid Statistics (Welsch, 2001, 2002; Welsch and Sonntag, 2003, 2004).



**Figure 1:** Admissions of clients with primary cannabis-related problems in German outpatient treatment centres, 1992 to 2003



Source: EBIS reports 1994–2001 (Türk and Welsch, 2000); German Addiction Aid Statistics (Welsch, 2001, 2002; Welsch and Sonntag, 2003, 2004).

## Validity of diagnoses

### Diagnosis according to ICD-10

The validity of the observed trend in treatment admissions strongly depends on the quality of diagnoses based on the DSHS. This system requires an ICD-10-based classification of substance-related disorders. As part of the CARED study the diagnoses assigned by the treatment centres' staff were validated by comparing them to diagnoses reassessed by standard instruments (CIDI, DIA-X). For this purpose, questionnaires ( $n = 223$ ) and clinical computerised interviews ( $n = 51$ ) were conducted and diagnoses assigned in compliance with the ICD-10 criteria.

In validation studies the results of a diagnostic instrument (test) are generally compared with an observed outcome (e.g. disease). Presented in a two-by-two table, results can be assessed for (i) correct classifications, that is, cases that were correctly identified to have or not to have the disease, and (ii) incorrect classifications, that is, cases that were incorrectly classified by the test instrument as having the disease (false positives) and those cases that were incorrectly classified as not having the disease (false negatives). In this validation, the test instrument was defined as the 'gold standard' (i.e. for ascertaining the presence or absence of cannabis-related disorders) and the diagnoses selected by the treatment centres as the instrument to be validated. Since the monitoring

system only reports positive cases of CCs, the resulting validation is incomplete: only those cases can be observed that were correctly or incorrectly (false positives) classified by therapists as having the disease (cannabis-related disorder). Self-evidently, the cases that were correctly or incorrectly (false negatives) classified by the therapists as not having a cannabis-related disorder were not observable.

Table 2 shows the results of the validation analysis. Overall, 25.6% of the clients were classified as not having a diagnosis of either harmful use or dependence if assessed by interview. Looking at the results from the opposite direction, 74.4% of the cases were found to fulfil criteria of a clinical diagnosis.

Compared with the original diagnoses of dependence, where 62.5% of the diagnoses were consistent, assessments were less in accordance with ICD-10 criteria if the client had received the diagnosis 'harmful use' (14.3%). Clients with an original diagnosis of 'harmful use' received more frequently a diagnosis of 'dependence' than a diagnosis of 'harmful use' (42.9%). Overall, distinguishing between 'dependence' and 'harmful use' in standard diagnostics is much less reliable than the general decision, whether CCs meet clinical criteria or not. On the whole, this might partly be a result of problems with the two-dimensional concept of 'abuse' or 'harmful use' and 'dependence' (Fulkerson et al., 1999).

For more than 74% of the CCs, validation showed that clinical criteria with respect to cannabis were fulfilled, and either 'harmful use' (F12.1) or 'dependence syndrome' (F12.2x) was the resulting diagnosis. Up to one-quarter of the CCs reported by outpatient treatment centres might have cannabis-related problems that are below clinical relevance. Discriminating between 'harmful use' and 'dependence', however, does not work well in practice, a problem that can be attributed, at least to some degree, to the intrinsic weakness of the concepts themselves.

**Table 2: Diagnoses in standard monitoring of treatment centres compared to diagnoses based on questionnaires or clinical interviews (ICD-10)**

	No diagnoses (%)	Harmful use ICD-10 (%)	Dependence ICD-10 (%)
Validation diagnoses based on			
Questionnaire (n = 136)	14.1	17.0	69.6
Interview (n = 39)	25.6	15.4	59.0

Source: Simon et al. (2004).

## Main diagnosis and other psychoactive substances

CCs classified with a cannabis-related diagnosis need not only fulfil ICD-10 criteria. Cannabis should also be the *main* substance in cases where other substance-related diagnoses are present, and the possibility that cannabis is used as a 'label' for clients with other problems should be ruled out. In order to examine this question, the validation analysed the prevalence of other substance-related diagnoses in the group of CCs, and the criteria used to determine the main diagnosis.

This analysis of multiple diagnoses of primary cannabis clients revealed that no other substance-related disorders were found in almost two-thirds of the clients. A combination of cannabis- and alcohol-related disorders was found in 21.2% of clients. While in most cases alcohol was involved, disorders related to stimulants without alcohol problems accounted for roughly 16% of multiple diagnoses (Table 3).

Therapists reported that the decision about the main diagnosis was based on the consequences (65.7%), patterns (59.3%) and frequency of cannabis use (41.3%). This is in line with the criteria that are also defined in the KDS for this classification. As no exact algorithm has been defined by the standards, validation cannot go beyond this basic check.

A considerable number of CCs (nearly two out of three) showed an exclusive cannabis-related diagnosis. The substance which plays the most important role after cannabis in the group of CCs is alcohol. It is not very likely that a cannabis-related diagnosis is used to hide alcohol problems. In the diagnostic process, therapists apply criteria as defined by ICD-10 and the national KDS. Thus, the classification of cannabis as a

**Table 3: Multiple diagnoses amongst cannabis clients (tobacco-related diagnoses excluded)**

Substance-related diagnoses	Questionnaire based (n = 184)	Interview based (n = 33)
	%	%
Cannabis only	33.7	63.6
+ alcohol	15.2	21.2
+ amphetamines/ecstasy	12.0	6.1
+ cocaine	3.8	0.0
+ alcohol + amphetamines/ecstasy	7.6	6.1
+ alcohol + cocaine	2.2	3.0
+ alcohol + amphetamines/ecstasy + cocaine	8.2	0.0
Other combinations	17.4	0.0

Source: Simon et al. (2004).



## Has treatment demand for cannabis-related disorders increased in Germany?

main substance seems to be based on empirical evidence and appropriate procedures. While single cases of misclassifications may be possible, CCs may not be judged as mislabelled in relation to other psychoactive substances.

### Main diagnosis and other mental disorders

The same type of misclassification as discussed for substance-related diagnoses could also take place in relation to non substance-related mental disorders. In such cases, the main problem of the clients in treatment might for example be psychosis, while cannabis problems might be only marginal. In order to analyse this question, prevalence of such diagnoses amongst CCs, as well as the correlation between disorders and the severity of cannabis-related disorders was analysed. Data are sourced from the clinical interviews of the CARED study which assessed a number of mental disorders (last 12 months) which are well known to be correlated with cannabis consumption (Hall and Solowij, 1997).

For CCs a number of such disorders was found. Close to 40% showed mood disorders, most often dysthymia (17.3%). More than one-third of the clients showed phobic disorders, and one out of eight showed anxiety disorders. There was a high rate of social phobia (17.3%) and nearly 11% of the clients suffered from psychotic disorders. Diagnoses F06.X were exclusively based on organic factors, including acute effects of drugs (Wittchen and Pfister, 1997). The majority of psychotic disorders and about one-third of the anxiety disorders and affective disorders were, therefore, more closely linked to drug use and may have been only of a short-term nature (Table 4).

Besides psychotic disorders, all diagnoses showed a high correlation with the severity of the cannabis diagnosis. Only a few cases of 'phobia' and 'mood disorder' were found where a cannabis-related diagnosis could not be validated. For these cases the basic problem might not be a cannabis-related disorder but another psychiatric problem (Table 5).

There is considerable prevalence of other psychiatric disorders amongst clients, which reflects a close relationship between cannabis use and psychiatric comorbidity found elsewhere (Hall and Solowij, 1997). As the majority of cases are linked to a validated classification of 'cannabis dependence', no misclassification arises from this, but rather these cases show additional problems which need to be taken into account and treated for this group of clients.

Table 4: Other mental disorders according to DSM-IV (clinical interview,  $n = 51$ )

Group of disorders	DSM-IV code	Diagnoses	%
Psychotic disorders			10.9
	F06.0	Psychotic disorder with hallucination	4.3
	F06.2	Psychotic disorders with delusion	7.8
	F23	Short psychotic disorders	2.2
Mood disorders/depression			39.1
	F06.32	Affective disorders with characteristics of depression	10.9
	F32.x	MDD, single episode	4.4
	F33.x	MDD, multiple episodes	13.0
	F34.1	Dysthymia	17.3
Anxiety disorders			15.2
	F06.4	Anxiety disorder	4.3
	F06.42	Panic attacks	10.9
	F41.0	Panic attacks without agoraphobia	2.2
	F41.1	Generalised anxiety disorder	0.0
Phobia			37.0
	F40.0	Agoraphobia without panic attacks	10.9
	F40.01	Panic disorders with agoraphobia	13.0
	F40.1	Social phobia	17.3
	F40.21	Animal phobia	6.5
	F40.22	Environmental phobia	6.5
	F40.23	Blood phobia	6.5
	F40.24	Specific phobia	4.3

Source: Simon et al., 2004.

Table 5: Groups of other mental disorders (DSM-IV) and cannabis diagnosis (ICD-10) (clinical interview,  $n = 46$ )

Disorders (DSM-IV)	Total (%)	Cannabis-related diagnoses		
		None (%)	Harmful use (%)	Dependence (%)
Psychotic disorders	10.9		16.7	14.8
Mood disorders	39.1	7.7	33.3	55.6
Anxiety disorders	15.2			25.9
Phobia	37.0	23.1		51.9

Source: Simon et al. (2004).

## Other factors

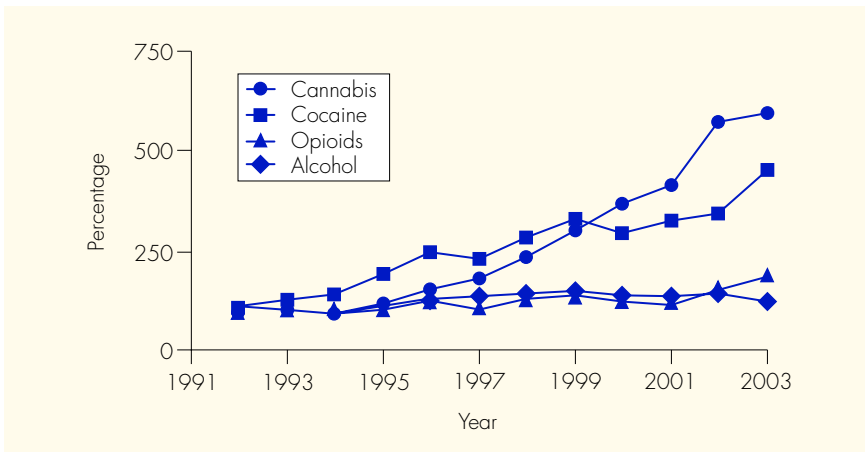
Two external factors were discussed, which might have influenced the increase in CCs: one relates to a general increase in treatment admissions, the other to changes in referral procedures.

### Overall increases in treatment admissions

Possible explanations for the increase in cannabis-related treatment admissions could be an overall improvement in (i) treatment availability; (ii) accessibility; or (iii) quality of services provided. For the years under inspection no general changes in drug policy, treatment standards or funding conditions could be observed in Germany, which may have increased the availability of or accessibility to treatment for drug users. So, the increase in cannabis-related treatment admissions cannot be attributed to these external factors.

This position is supported by data on treatment admissions for other substance-related disorders involving other drugs. A general positive shift in treatment quality or availability would most likely have increased the number of clients for all different substances alike. However, as shown in Figure 2, relative to the year 1992, the number of cannabis clients in 2003 increased sixfold, the number of clients with stimulants-related problems more than fourfold, while the number of clients with alcohol- and opioid-related problems — the main focus of treatment services up to that time — only showed a slight increase.

Figure 2: Client admissions in outpatient treatment by main drug, 1992 to 2003 (1992 = 100%)



Source: EBIS reports 1994–2001 (Türk and Welsch, 2000); German Addiction Aid Statistics (Welsch, 2001, 2002; Welsch and Sonntag, 2003, 2004).

This clear increase found for CCs clearly exceeds the general trend for total treatment admissions and exceeds all other substances besides ecstasy. Apart from the fact that the absolute numbers of ecstasy-related disorders are still small, ecstasy was frequently miscoded by the treatment centres under 'other substances', which might have inflated the rates artificially. This means that there is no indication of a general increase in treatment availability. Staff measured in full-time staff member equivalents between 1996 and 2003 only increased by 1.2%, which also makes it clear that treatment availability did not change dramatically during the reporting period.

### Changes in referral procedures

An increase in treatment admissions might also be the consequence of changes in referral procedures. If, for example, the Narcotic Drugs Act was enforced more rigorously than before, treatment admissions would rise without any changes taking place in the underlying medical or psychological treatment needs in the population. In order to examine this type of effect, data on treatment referrals from the years 1998 to 2003 were examined.

In 2003 more than 70% of all clients entered treatment through three main pathways: 20% were 'internally motivated' (self-motivated) and came directly to the treatment facilities; 25% were motivated by family or friends and 27% were referred through judicial or police authorities. While compared with 1998 the total number of cannabis clients in 2003 increased by 118%, the number of clients who came directly into treatment increased by 96%, referrals through justice or police by 109%. The biggest increase was due to referrals through other counselling services (Table 6).

Table 6: Access to outpatient treatment for cannabis clients

Referrals into treatment	Compared with 1998 (= 100%)				Referrals in 2003 (%)
	2000	2001	2002	2003	
No referrals/direct access	129	141	161	196	21.5
Relatives/friends	141	153	178	195	24.5
Job/school	118	151	175	214	6.4
GP/psychotherapist	127	158	195	195	3.4
Hospital	158	182	240	236	1.7
Inpatient addiction facility	141	86	166	244	1.9
Drug counselling	149	137	239	338	1.5
Other counselling services	296	412	514	514	8.8
Justice/social administration	105	114	196	209	26.3
Others	161	207	275	286	4.1

Sources: EBIS reports 1994–2001 (Türk and Welsch, 2000); German Addiction Aid Statistics (Welsch, 2001, 2002; Welsch and Sonntag, 2003, 2004).



### Has treatment demand for cannabis-related disorders increased in Germany?

The hypothesis that the increase in treatment admissions of CCs was caused to a large extent by increasing pressure from law enforcement and social administration is not supported by these data. Instead, treatment admissions have increased more or less at the same extent for a number of types of referring institutions. The biggest increase was found for referrals by other counselling services, which might indicate better networking that facilitated access to drug treatment for cannabis users through these channels.

## Trends in treatment demand and prevalence of cannabis use in the population

Survey data indicate that the observed increase in treatment admissions for cannabis-related disorders was accompanied by a constant increase in the prevalence of cannabis use in the general population. Between 1992 (15%) and 2003 (33%), lifetime prevalence of cannabis use was found to have significantly increased by a factor of two. In the same time, last year prevalence (4% in 1992, 12% in 2003) increased by a factor of three (Kraus, Augustin and Orth, 2005).

Population estimates of recent users (last 12 months) aged 18–29 years derived from cross-sectional surveys in 1990/92, 1995/97, 2000 and 2003 were compared with the estimated number of cannabis clients for the respective years. Survey data for 1990 were taken as proxy for 1992. The number of recent cannabis users increased from 935 000 in 1992 up to 2 105 000 in 2003. In the same period the number of clients treated for cannabis-related problems within a 1-year reporting period (admissions plus takeover from the year before) increased from 4 353 to 25 485 cases. The ratio of recent users in contact with outpatient treatment did not remain constant but increased at a disproportional rate. While, in 1992, 4.7 clients per 1 000 recent users were admitted for treatment, in 2003 12.1 users had entered treatment (Table 7).

Another way of comparing trends of recent cannabis use and treatment admissions is shown in Figure 2. Normalising the numbers of cannabis users and treatment

Table 7: Estimated number of annual cannabis users and clients

	1992	1995	2000	2003
Cannabis users (12-month prevalence, 18–29 years) <sup>a</sup>	935 000 <sup>b</sup>	1 590 000	1 918 000	2 105 000
Cannabis clients <sup>c</sup>	4 353	5 246	16 112	25 485
Number of clients per 1 000 users	4.7	3.3	8.4	12.1

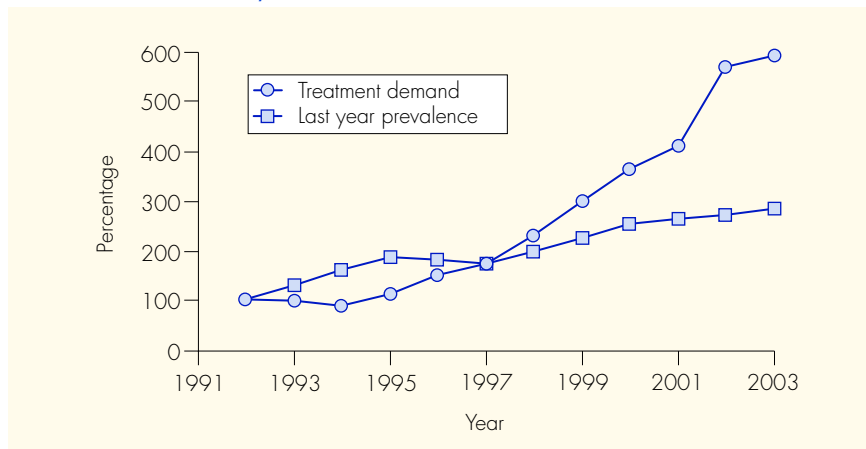
<sup>a</sup>Source: Kraus, Augustin and Orth, 2005.

<sup>b</sup>1990 survey.

<sup>c</sup>Source: EBIS reports 1994–2001 (Türk and Welsch, 2000); German Addiction Aid Statistics (Welsch, 2001, 2002; Welsch and Sonntag, 2003, 2004).



**Figure 3: Prevalence of last year cannabis use and cannabis clients since 1992**



Source: EBIS reports 1994–2001 (Türk and Welsch, 2000); German Addiction Aid Statistics (Welsch, 2001, 2002; Welsch and Sonntag, 2003, 2004).

admissions for the year 1992 to an index value of 100, the changes for the consecutive years can be presented as percentages relative to the year 1992. While treatment admissions increased by 500%, the prevalence of recent use increased by only 190% (Figure 3).

Both analyses show that the number of clients with primary cannabis-related problems in treatment (CCs) grew faster than the prevalence of recent cannabis use in the population. A direct comparison, however, is too simple a model, since a delay of 8 years on average between start of use and entering treatment needs to be considered (Strobl et al., 2007).

## Conclusions

A clear increase in treatment admissions for primary cannabis-related disorders in outpatient treatment was found in Germany between 1992 and 2003. The number of cases increased roughly by 500%. Three-quarters of persons with cannabis-related diagnoses in the treatment statistics were diagnosed appropriately as cannabis-related disorders fulfilling clinical criteria. The remaining cases may have had cannabis-related problems, but did not reach the level of clinical significance. In cases where multiple diagnoses exist, information on the diagnostic process as well as prevalence of such diagnoses showed no indication that cannabis was assigned as main drug incorrectly. For logical reasons there is also no reason to call into question cannabis as main diagnosis for the majority of cases.



## Has treatment demand for cannabis-related disorders increased in Germany?

Other factors which might have influenced treatment admissions have not been analysed here. In particular, a change in the perception of risks linked to cannabis might have increased cannabis users' willingness to enrol in treatment. This, and other, hypotheses might be evaluated by future research. While in Germany and other countries cannabis-related problems were historically seen as minor and of limited relevance for public health, public debate in recent years has begun to take this topic more seriously. It will be necessary to find a new balance for a treatment system that was tailored in the past mainly to serve the needs of injecting users of heroin. In this respect, the outcome of the CARED study is in line with the results of a city-based evaluation of treatment services in Hamburg (FOGS, 2006) as well as a regional study on treatment provision in Munich (Perkonigg et al., 2004). Given the high and partly still rising prevalence of cannabis use in many European countries, this might become a problem for other countries as well (EMCDDA, 2005, 2007).

## Acknowledgement

The National Addiction Aid Statistics and the CARED study was financially supported by the German Federal Ministry for Health and Social Security (BMGS).

## References

- Bundesministerium für Gesundheit (BMG) (2002), 'Auswertung der Kurzberichte der Bundesländer 2001', Bundesministerium für Gesundheit und Soziale Sicherung, Berlin/Bonn.
- EMCDDA (2000), 'Treatment demand indicator. Standard protocol 2.0', European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2005), *Annual report 2005: the state of the drugs problem in the European Union and Norway*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- EMCDDA (2007), *Annual report 2007*, European Monitoring Centre for Drugs and Drug Addiction, Lisbon.
- FOGS (2006), *Expertise, Zugang zu jungen Cannabiskonsumenten*, FOGS Gesellschaft für Forschung und Beratung im Gesundheits- und Sozialbereich, Cologne.
- Fulkerson, J., Harrison, P., Beebe, T. (1999), 'DSM-IV substance abuse and dependence: are there really two dimensions of substance use disorders in adolescents?', *Addiction* 94: 495–506.
- Hall, W., Solowij, N. (1997), 'Long-term cannabis use and mental health', *British Journal of Psychiatry* 17: 107–108.
- Hall, W., Degenhardt, L., Teesson, M. (2004), 'Cannabis use and psychotic disorders: an update', *Drug and Alcohol Review* 23: 433–443.
- INSERM (2001), *Cannabis. Quels effets sur le comportement et la santé?*, INSERM, Paris.
- Kraus, L., Augustin, R. (2005), 'Repräsentativerhebung zum Gebrauch und Missbrauch psychoaktiver Substanzen bei Erwachsenen in Deutschland. Epidemiologischer Suchtsurvey 2003', *Sucht* 51(Suppl. 1): S4–S57.
- Kraus, L., Augustin, R., Orth, B. (2005), 'Illegale drogen einstiegialter und trends. Ergebnisse des epidemiologischen suchtsurvey 2003', *Sucht* 51(Suppl. 1): S19–S28.





- Perkonigg, A., Pfister, H., Lieb, R., Bühringer, G., Wittchen, H.-U. (2004), 'Problematischer Konsum illegaler Substanzen, Hilfesuchverhalten und Versorgungsangebote in einer Region', *Suchtmed* 6: 22–31.
- Simon, R., Sonntag, D., Bühringer, G., Kraus, L. (2004), 'Cannabisbezogene Störungen: Umfang, Behandlungsbedarf und Behandlungsangebot in Deutschland', IFT Institut für Therapieforschung, München.
- Strobl, M., Klapper, J., Pelzel, K.-H., Bader, G., Zahn, H., Lange, N. (2007), 'Suchthilfestatistik 2006 für Deutschland. Tabellenband für die ambulante Suchtkrankenhilfe', IFT Institut für Therapieforschung, München  
[www.suchthilfestatistik.de](http://www.suchthilfestatistik.de)
- Türk, D., Welsch, K. (2000), 'Jahresstatistik 1999 der ambulanten Beratungs- und Behandlungsstellen für Suchtkranke in der Bundesrepublik Deutschland. EBIS-Bericht für den Zeitraum 1.1.-31.12.1999', *Sucht* 46 (Suppl.).
- Welsch, K. (2001), 'Jahresstatistik 2000 der ambulanten Suchtkrankenhilfe in Deutschland', *Sucht* 48 (Suppl. 3).
- Welsch, K. (2002), 'Deutsche Suchthilfestatistik 2001 für ambulante Einrichtungen' *Sucht* 49 (Suppl. 1): 7–51  
[www.suchthilfestatistik.de](http://www.suchthilfestatistik.de)
- Welsch, K., Sonntag, D. (2003), 'Deutsche Suchthilfestatistik 2002 für ambulante Einrichtungen', *Sucht* 49(Suppl. 1): 7–41.
- Welsch, K., Sonntag, D. (2004), 'Deutsche Suchthilfestatistik 2003', *Sucht* 50 (Suppl. 1).
- Wittchen, H.-U., Pfister, H. (eds) (1997), *DIA-X-Interviews: Manual für Screening-Verfahren und Interview*, Swets & Zeitlinger, Frankfurt.
- WHO (1994), 'International Statistical Classification of Diseases and Related Health Problems. Tenth Revision — ICD-10', World Health Organisation, Geneva.





# Chapter 16

## Risk factors for cannabis use

**Keywords:** cannabis – prevention – protective factors – risk factors – sociology

### Setting the context

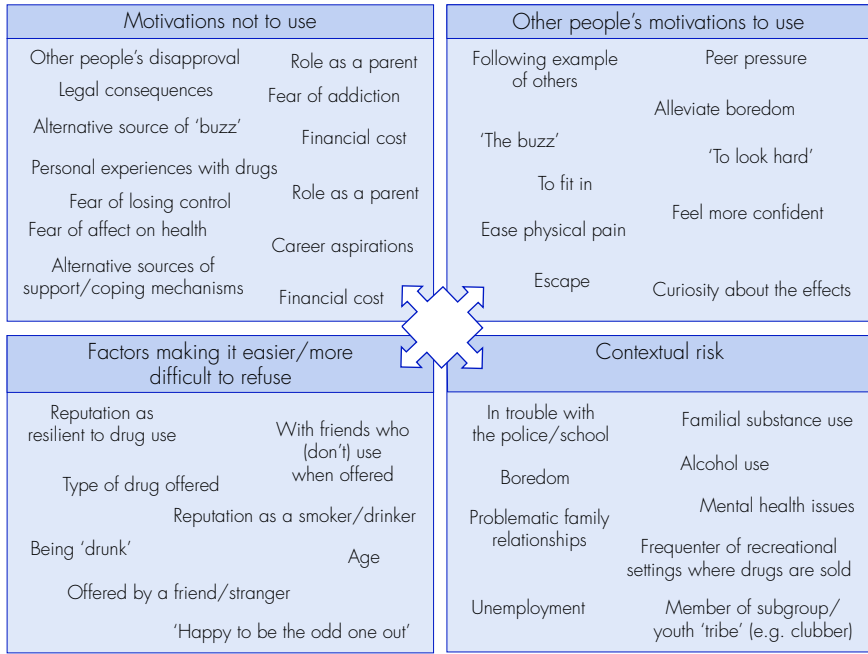
Lists of risk factors and protective factors are common features in the prevention and treatment literature on cannabis and other illicit drugs. Both groups of factors could relate to an individual's genetic make-up and personality, or to their familial, social and physical environment. It is beneficial to understand the range of factors that have been identified for cannabis. Moreover, it is not always easy to judge which factors carry more weight for cannabis, or to exclude factors that may not be relevant to a specific group of users' context. The diagram below (Figure 1), adapted from a UK Home Office report, offers a simplified overview of risk and protective factors.

This chapter explores the risk factors associated with cannabis use. In doing so, a distinction is drawn between cannabis use *per se* and the development of problematic cannabis use. The chapter reveals that many factors are linked with problematic cannabis use, including genetic vulnerability to certain psychological conditions, early use of tobacco and alcohol, dysfunctional family relationships, behavioural problems, peer associations, family substance use and early initiation.

### Further reading

UK Home Office (2007), *Identifying and exploring young people's experiences of risk, protective factors and resilience to drug use*, Home Office Development and Practice Report, Stationery Office, London.

Figure 1: Overview of risk and protective factors





## Risk factors for cannabis use

Niall Coggans

### Introduction

Much effort has gone into researching the factors that increase the likelihood of using drugs (risk factors) and the factors that decrease the likelihood (protective factors) (e.g. Hawkins et al., 1992; Lloyd, 1998; Rhodes et al., 2003). The factors that influence individuals and groups to use cannabis are numerous and operate at all levels, from the individual to the social. Greater awareness of these various factors should lead to more effective and more precisely targeted educational and health promotion interventions. The purpose of this chapter is to highlight the risk factors for cannabis use.

There are two issues in relation to the title of this chapter, *risk factors for cannabis use*, that require clarification: (i) what is a risk factor and (ii) in what way or to what extent is cannabis use a problem? First, the nature of risk factors. The term risk factor is widely used in public health to identify and describe individual or social predictors of disease or undesirable conditions/behaviour. Of particular interest from a public health perspective are those factors which it is possible to reduce through prevention interventions. This is also true for drug-related health problems, including cannabis-related problems. However, do risk factors *cause* drug use and/or drug-related problems, or are risk factors predictive in that they are statistically associated with the behaviour in question?

A cause of a drug-related problem is something that exists prior to the drug-related problem (the effect) and the occurrence of a prior event or state of affairs would ensure, or increase the likelihood, of the drug-related problem happening. An association, on the other hand, is where there is a relationship between a drug-related problem and some other event or state of affairs. The key distinction between cause and association is that an association does not imply causation. It may be that there is a causal relationship between two associated phenomena or that the association is due to a third factor. Where an association between a risk factor and a drug-related problem has been found, a number of issues need to be investigated to assess the relationship for causality, including consistency with other studies, plausibility, temporal sequence, dose–response and strength of association (Campbell and Machin, 1999).

Taken individually, risk factors are unlikely to be causal in a direct ‘if A then B’ manner. Moreover, individual risk factors for drug use are unlikely to be either necessary or sufficient for the emergence of drug use and/or drug-related problems. Many of the risk factors for drug problems are mediated through individual development and social interaction. Problematic drug use is therefore the result of a complex of different risk



## Risk factors for cannabis use

factors which cumulatively increase the likelihood of drug use and/or problems. In other words, risk factors do not cause, but are associated with problematic cannabis use.

Second, to what extent is cannabis use a problem? In this discussion of risk factors related to cannabis use a distinction is made between experimental or recreational use of cannabis and cannabis use that is problematic. Problematic cannabis use is usually defined in terms of diagnosed cannabis dependence or substance use disorders using standard diagnostic criteria (for more detail see Beck and Legleye, this monograph), and often includes people in treatment programmes for their cannabis-related problems. Experimental or recreational cannabis use, on the other hand, is often understood as use which is not bound up in adverse social, mental or physical health effects for the user (Coggans et al., 2004).

The extent to which drug use is actually or potentially harmful to individuals will depend on the nature and purity of the drug concerned, mode of ingestion, and the pattern of its use by the individual. Cannabis use will not necessarily continue once started, as many will stop after a period of recreational use. For example, in a longitudinal study of a sample of German cannabis users, half stopped of their own accord in their 20s (von Sydow et al., 2001). Moreover, the majority of young people who smoke cannabis do not experience cannabis-related problems (see Witton, this monograph, vol. 2). It could be argued that the term 'risk factor' is inappropriate in relation to this apparently non-problematic form of cannabis use. While it might devalue the concept of risk factors by referring to risk factors in relation to behaviour that is seen as undesirable by some people, rather than behaviour with clearly manifested problems, there remains the need to recognise that those who do develop cannabis-related problems will emerge from the wider population of cannabis users. From a prevention perspective, there is, therefore, a need to work with existing cannabis users who may not have developed cannabis-related problems in order to reduce the likelihood of their doing so. It is important to distinguish between predictive factors related to cannabis use that is non-problematic and factors that predict cannabis-related problems.

Those who use cannabis heavily and for a substantial period of their lives are considerably fewer than those who have ever used cannabis (House of Lords Select Committee on Science and Technology, 1998). While those who do use cannabis heavily over long periods of time in adulthood may develop cannabis-related problems, such as dependence, it is not the case that such use will necessarily be perceived as problematic by the users concerned (Coggans et al., 2004). Although it is a truism that there is no such thing as a safe drug, occasional 'light' use of cannabis will carry little risk for large numbers of people. Nonetheless, some people do experience problems with cannabis. Moreover, there is also concern over the potential for cannabis use among young people to compromise healthy development.







This chapter is not intended to be an exhaustive review of the field, but to provide an overview of the nature and scope of the risk factors that predispose people to problematic cannabis use, including routes to cannabis use, early initiation, social environment (family and peers), psychological risk factors, and the growing evidence of genetic risk factors. When reviewing the relevant literature, however, a problem arises, as much research on risk factors shows little concern for distinguishing harmful drug use from drug use in its own right. Moreover, it is argued here that there is a need for a coherent view of the difference between risky or non-risky cannabis use, or what constitutes problematic or non-problematic cannabis use. Thus, this chapter includes risk factors for different types of cannabis use, and this is a limitation to which more attention should be paid in future research.

The term ‘problematic cannabis use’ is employed here to mean cannabis use that gives rise to psychological, physiological or behavioural problems. It is not meant here to reflect only specific diagnostic criteria such as ICD-10 or DSM-IV. Nor is the term used here to reflect frequency and intensity of use beyond arbitrary cut-off points. Here, problematic cannabis use refers to cannabis use which results in health problems with substantive impacts on the individual’s functioning. Potential problems include, for example, early school leaving (Lynskey et al., 2003a), mental health (Henquet et al., 2004), depression (Bovasso, 2001), dependence (Swift et al., 1998), impairment of memory and attention (Solowij et al., 2002), and respiratory functioning (Taylor et al., 2000).

## Routes to cannabis use and cannabis dependence

Cannabis is often described as a ‘gateway’ drug to the use of other, more harmful drugs such as heroin and cocaine. While there is considerable debate over the nature of this gateway effect, if any (e.g. Morral et al., 2002), there are discernible associations between early use of tobacco, alcohol and cannabis.

### Patterns of drug use progression

Kandel’s stage theory of drug use — that substance use initiation and progression, in those cases where progression occurs, follows predictable stages — has informed prevention efforts (Kandel and Faust, 1975; Kandel et al., 1992). However, such predictable progression, and with it the possibility of preventive interventions, may not be the case for those more at risk of developing problematic patterns of drug use. Contrary to the Kandel model, in some cases those at risk of developing problematic drug use are more likely to have used cannabis before using alcohol and more likely to have used other illicit drugs before using cannabis (Mackesy-Amiti et al., 1997). The



### Risk factors for cannabis use

point here is that the typical pattern of progression described by Kandel and others may relate more to those for whom progression to problematic use is less likely. Moreover, routes into drug use may not be as one-way as per Kandel's stage theory. For example, there is evidence that cannabis can lead to nicotine dependence (Patton et al., 2005; Amos et al., 2004).

The nature of the relationships between use of alcohol, tobacco and cannabis is the subject of ongoing debate. The Kandel stage model can be interpreted as implying a sequence of causal relationships, such that use of a prior substance is (somehow) causally related to the next substance in the sequence. More plausibly, the model is more of a description than an explanation of stages of drug use, with no implication of causality intended in its original formulation. What is less in doubt is that there are correlations between the use of cannabis and drug use progression (e.g. Blaze-Temple and Lo, 1992; Fergusson and Horwood, 2000; Lynskey et al., 2003b), and between the use of alcohol, tobacco and cannabis in adolescent populations (see also Monshouwer, Smit and Verdurmen, this monograph). Nonetheless, Lynskey et al. (2003b) noted that while there were associations between cannabis use and progression to other drugs and drug dependence, it was not possible to draw strong causal inferences about the role of cannabis.

What might explain these associations between cannabis use and use of other drugs? Lynskey et al. (1998) reported that the correlations between alcohol, tobacco and cannabis use could be explained by a general 'vulnerability to substance use' factor, based on connections with delinquent or substance-user peers, novelty seeking and parents' drug use. More recently, Morral et al. (2002) concluded that users of any drug have a greater inclination to use other drugs and argued that this general propensity theory could adequately explain apparent gateway effects.

### Alcohol and tobacco

In addition to correlations between use of cannabis and more harmful drugs, there are also associations between adolescent alcohol and tobacco use, on the one hand, and cannabis use on the other. In a sample of 11- to 16-year-olds, illicit drug use (primarily cannabis for the majority of regular users of drugs) and cigarette smoking were related to alcohol use. Those who had been drunk more often were more likely to smoke cigarettes and to use other drugs (Sutherland and Willner, 1998). The associations between number of episodes of drunkenness and either cigarette use or other drug use were not age dependent. Of those who had been drunk less often, from one to five times, 13% reported other drug use, while of those who had been drunk more than 20 times 58% reported other drug use. Adolescents who drank more than three times in the previous week and who drank five or more units of alcohol were more likely to begin



cannabis use (Coffey et al., 2000). But another study found that there was no statistically significant relationship between drinking in adolescence and cannabis dependence in early adulthood, after possible confounding factors had been taken into account (Wells et al., 2004).

Adolescents who smoke tobacco are at greater risk of developing cannabis dependence by their mid-20s (Lewinsohn et al., 1999; Coffey et al., 2000). A recent longitudinal study in which data were gathered from participants at 11 years and 20 years of age reported that 'persistent' tobacco smokers were more likely to use cannabis and to develop dependence on cannabis, as well as to use other drugs and develop dependence on other drugs (Vega and Gil, 2005). Coffey et al. (2000) also demonstrated that tobacco smoking and not alcohol was a risk factor for the transition from experimental cannabis use to a more established cannabis habit, with greater degree of tobacco smoking being predictive of subsequent greater cannabis use.

A fundamental issue with cannabis, alcohol and tobacco is whether the gateway theory is anything other than an artefact of patterns of typical drug use initiation and progression. It has been argued that the overriding trend in drug use over time is for young people to reduce their illicit drug use and that problematic drug use is best predicted by family, social and psychological deficits (Peele and Brodsky, 1997).

In many ways the numerous studies of drug initiation and progression provide descriptions of routes to drug use. For the more fundamental issue of explanation there is a need to consider the individual and social context in which these routes are recorded.

## Age of initiation

Social, childhood and behavioural problems are associated with early onset of cannabis use, which in turn can lead to later association with substance users and educational disengagement. In turn, these latter risk factors can lead to development of a range of psychosocial risk factors that increase the likelihood of substance-related problems (Fergusson and Horwood, 1997). Comparison of recent-cannabis-onset adolescents and adults found that those who start to use cannabis in adolescence are more likely to develop cannabis dependence than adults who initiate cannabis use (Chen and Anthony, 2003). Children who manifest behavioural disinhibition are at elevated risk of starting to drink alcohol at an early age (King et al., 2004). Moreover, early initiation of alcohol use is associated with increased risk of substance use disorders (McGue et al., 2001). Cannabis users who began using cannabis before late adolescence, and had used three or more other drugs before starting cannabis, were at higher risk of developing cannabis dependence within 2 years of onset (Chen et al., 2005).



### Risk factors for cannabis use

An investigation of the early onset cannabis users, who started using before they were 17 years old, revealed an association with reduced measures of verbal IQ. One possible explanation for this is that cannabis adversely, and durably, affects cognitive faculties in younger people whose brains are still developing (Pope et al., 2003). It is also possible, however, that poorer verbal IQ is a consequence of disengagement from mainstream education, which is a risk factor for early cannabis use. Such disengagement from the educational mainstream may be reinforced by cannabis use. Indeed, Pope et al. (2003) speculate that the early onset users in this study had lower verbal IQs because they were less motivated to engage with education. Although far from conclusive, these data are consistent with other studies that show an association between poor educational status and early onset of cannabis use (Lynskey et al., 2003b).

Adolescents with substance use disorders and adults with substance use disorders who had initiated cannabis use in adolescence were quicker to develop dependence, have behavioural problems and major depression, than comparison groups who started cannabis use in early or later adulthood (Clark et al., 1998b).

Young people who are exposed to drug use may be more likely to initiate drug use themselves, at least on the basis of the argument that exposure provides both drug-using models (parents, siblings, peers) and availability of drugs. The younger children are when they experience such models and availability, the greater the risk of initiation at an early age, with a consequent elevated risk of developing problematic use in later years. One study of Scottish pre-adolescents (10–12 years of age) found that over a third had been exposed to drug use and one in seven had been offered drugs (McIntosh et al., 2003). McKeganey et al. (2004) found that those 10- to 12-year-olds who had initiated drug use (in most cases cannabis) were more likely to use tobacco and alcohol, and have problem behaviour and family difficulties. Pre-adolescents (defined as 10–12 years of age) who used tobacco and had behavioural problems were at risk of early adolescent cannabis use (Clark et al., 1998a).

Evident from the research findings, which show an association between early onset and later problematic cannabis use, is that the association may not be causative. Indeed, as highlighted by Lloyd (1998), early onset use may only be an indicator of other risk factors that predict later problematic drug use. Thus, age itself might be less the issue than the interplay of other risk factors.

Other risk factors that have to be taken into account are the influences of family and peers, psychological risk factors and genetic factors.

## Social environment: family

The family and peer networks have received great attention in risk factor research (Rhodes et al., 2003). A study of 14- to 15-year-olds across five European cities concluded that 'attachment to mothers' inhibited drug use, an aspect of family relationships that appears to be more important for boys than girls. This protective factor was more important than living with both parents. However, this protective factor does not extend to antisocial young people (McArdle et al., 2002).

Kosterman et al. (2000) studied initiation of alcohol and cannabis use among adolescents and found that exposure to others who use drugs increases the risk of early initiation of cannabis use; as do parents who are not 'proactive' and/or parents who fail to set clear 'family standards'. Chen et al. (2004) make the point that initiation to tobacco use is more likely to occur in a social environment that is tolerant of smoking.

Foxcroft and Lowe (1995) found relationships between adolescents' perceptions of parent-centred authoritarian or neglectful family life and use of alcohol, tobacco and some illicit drugs. However, this was not observed for cannabis use. In other words, cannabis use *per se* was not related to pathological family relations in the way that other drug use was. In light of what is known about the risks of dysfunctional family relationships for elevation of risk for problematic use, it may be that cannabis use in this sample was non-problematic.

Young people exposed to stressors in the family, such as disrupted family structure and poor quality of family relationships, are more likely to use cannabis and to develop problematic patterns of cannabis use (Butters, 2002). Moreover, a compounding effect in terms of school problems was found in this study: family disruption elevated the likelihood of school problems, which in turn increased the chances of developing problematic cannabis use. The confounding nature of the risk factors delinquency and school problems with cannabis use was also highlighted in an American study of nearly 14 000 11- to 21-year-olds (van den Bree and Pickworth, 2005). Children with social disadvantage, dysfunctional family life and behavioural problems are more likely to become adolescents who associate with delinquent or drug-using peers (Fergusson and Horwood, 2000). A recent study of a sample of adolescents in Turkey noted the significant statistical association between cannabis use and cannabis-using peers (Tot et al., 2004).

The extent of parental monitoring of children's activities may influence likelihood of substance use, such that lower levels of monitoring increased the risk of initiation of drug use (Chilcoat et al., 1995; Bukstein, 1995; Kandel, 1996). Lack of closeness in parents' relationships with their children, and inadequate time spent by parents with their children are risk factors (Bukstein, 1995; Hawkins et al., 1992; Kandel, 1996). To



### Risk factors for cannabis use

some extent, this implies that the causal direction is one-way. It is likely that the process is more complex, with some degree of influence of children's behaviour on their parents or carers.

There is much about the precise nature of the relationships within high-risk families that is not known, such as the characteristics of the parents and the ways in which they interact with their children. A study of the comorbidity of drug misuse and anxiety disorders in families found that young adolescents' drug use was more strongly associated with parental drug misuse (diagnosed as having alcohol or drug disorders) than with diagnosed parental anxiety disorders. Children of drug misusers were, along with controls, less likely to manifest anxiety disorders than children of parents with anxiety disorders. Children of drug misusers were more likely to have behavioural problems, itself a risk factor for drug use and drug problems (Merikangas et al., 1998).

It is evident that the quality of relationships within the family is important in terms of emotional support, parenting style, control and family disruption. However, the relationship between these factors and cannabis use or problematic cannabis use is probably indirect in the sense that the presence of such factors increase the likelihood of young people developing emotional and behavioural problems in general. And it is the development of these problems that increase the chances of developing problematic patterns of drugs use.

As young people grow and develop, the influence of the family wanes in many cases as the influence of peers increases.

## Social environment: peers

That cannabis users' peers are more likely to smoke cannabis than the peers of non-users is a commonplace of the literature. There is a need for considerable caution in going beyond the data when interpreting statistical associations between cannabis users and their peers' cannabis use. In many cases it is not possible to specify the nature of the association: that is, does A cause B, vice versa, or neither? Yet, on the basis of such data it has often been asserted that drug-using peers somehow pressure or encourage drug use in their non-drug-using peers. Peer preference is a more plausible interpretation, such that those inclined to the use of cannabis deliberately associate with others who do so (Coggans and McKellar, 1994). For example, peers may in some instances encourage or even coerce others to take drugs, but there is a need to recognise that peer influences can take different forms, ranging from tolerance of drug use, through support of drug use to active encouragement of drug use. Often young people actively assort themselves to form groups which share similar interests and aspirations, which do not fit with (bad) pusher and (innocent) victim stereotypes.



Changes of frequency in adolescent drug use have been found to precede changes in peer variables (Farrell and Danish, 1993). These researchers also analysed their data in different ways in order to compare three different hypothetical models, namely, a) drug use was a consequence of emotional restraint (ability to deal with negative affect) and peer variables (drug using peers and peer pressure); b) drug use was a cause of changes in emotional restraint and peer variables; and c) a reciprocal model that included both causes and consequences of drug use. While all three models 'fit the data fairly well', the reciprocal model was the best fit. Of particular note was their conclusion that 'peer drug models and peer pressure were not related to subsequent changes in gateway drug use' and 'changes in peer drug models were ... predicted by previous levels of gateway drug use' (Farrell and Danish, 1993: 327). The authors also drew attention to the need for caution with data of this kind and emphasised the importance of studying dynamic models that address both the causes and the consequences of drug use.

Dobkin et al. (1995) examined the antecedents of early onset substance use in male adolescents and reported that individual characteristics were better predictors than association with deviant friends. They concluded that the argument that deviant youth seek out like-minded friends was plausible. Kandel (1996) suggested that the influence of peers on adolescent substance use has generally been overestimated, that this overestimate has tended to be at least double the actual effect, and that selection is at least as important as influence, if not more. Other researchers concluded from their review of the literature that selection 'may make a substantial contribution to the association between drug behaviors of friends, and that failure to control for selection may overestimate the contribution of influence' (Bauman and Ennett, 1996: 188). All of which emphasises the need to understand the factors that predispose young people to select drug-using associates.

A risk factor for cannabis users' transition to problematic cannabis use is having more friends who use drugs and less perceived parental disapproval of cannabis, with the effects found to be greater for adolescent females than males (Butters, 2004). Not all cannabis users with cannabis-using peers will progress to problematic cannabis use. Progression to problematic cannabis use will depend on other risk factors and how these interact with the risks associated with cannabis-using peers.

Interactions within the school environment have been identified as important, although it can be difficult to disentangle the relative contribution of social relationships and educational experience as potential risk factors. For example, poor academic performance and classroom behaviour were found to be important risk factors for boys in particular (Hops et al., 1999). Lower attachment to school has been associated with higher levels of substance use (Ennett et al., 1997) and academic performance linked with subsequent academic and home self-esteem (Filozof et al., 1998). However, others



## Risk factors for cannabis use

have cautioned against too great an emphasis on self-esteem in prevention initiatives, due to uncertainty over the relationship between (low) self-esteem and substance use (Schroeder et al., 1993). Nonetheless, academic failure is a risk factor for adolescent drug use, as is low commitment to school (Hawkins et al., 1992).

The influence of peer pressure, especially when perceived as some form of coercion, has been overstated. More subtle forms of peer influence, such as attractive role models, are likely to have an influence. When young people with emotional or behavioural problems perceive cannabis-using others as attractive role models then they may be more likely to adopt similar behaviours. The difference between a young person who, with cannabis-using role models, becomes a cannabis user, on the one hand, and a problematic cannabis user, on the other hand, is explicable by presence of other risk factors described in earlier sections.

## Psychological risk factors

Rhodes et al. (2003) point out that within the European literature, there is considerable agreement that there are correlations between problematic drug use and a variety of problematic behaviours. Conduct problems precede and influence early initiation of cannabis, the onset of which is greater where there is also early tobacco use (Pederson et al., 2001). There are also gender-specific influences of different aspects of problem behaviour prior to cannabis initiation. More serious conduct problems were an important predictor of cannabis initiation in boys, while aggressive and covert conduct problems predicted cannabis initiation in girls.

In a study of 15- to 16-year-olds, the heavier users of cannabis were characterised in three groups, according to a range of behavioural, relationship and psychological measures: namely, 'antisocial', 'unhappy' or 'ordinary' (Miller and Plant, 2002). While the antisocial and unhappy groups of young heavy cannabis users had already exhibited negative behaviours, including other substance use, the ordinary group were less likely to be heavy users of other substances. All of which is a reminder that cannabis use and even heavy cannabis use is not in itself sufficient to lead to problematic use of other drugs.

In a sample of 12- to 18-year-olds in treatment for cannabis abuse or dependence, most had a range of psychological and behavioural problems (Tims et al., 2002). Those with higher levels of drug misuse had problems with relationships, and with their psychological and physical health. The extent to which cannabis use, on the one hand, and individual and social circumstance (historical or present) on the other, are causal is difficult to specify. There is every likelihood that those with personal difficulties who subsequently use cannabis will exacerbate these problems.





In a study of French 15- to 22-year-olds, 'borderline symptomatology' for a range of personality problems appeared to influence motivations for cannabis use, in particular expansion of awareness. However, mood enhancement for boys and expansion of awareness for girls were better predictors of cannabis use than psychological problems. While cannabis dependence in boys was related to psychological problems, it was related to motivation for expanded awareness in girls (Chabrol et al., 2005). 'Permissive' beliefs about the nature and utility of cannabis is associated with cannabis use but not dependence, while beliefs that cannabis would ameliorate anxiety, boredom and 'suffering', and improve mood, were the only predictors of cannabis dependence (Chabrol et al., 2004).

In a similar vein, a study that related perceived functions of cannabis to cannabis use and to amount of use found that those who used for respite from negative moods were at risk of developing problems with cannabis. This contrasts with those who used cannabis for social functions, which was not related to degree of cannabis use (Boys and Marsden, 2003).

There is much current debate about the potential for cannabis to exacerbate or precipitate psychosis (see Witton, this monograph, vol. 2). However, psychotic symptoms can also precede cannabis use. While the debate over common vulnerability versus bidirectional causal pathways between cannabis and psychosis continues, psychotic symptoms were found to be a risk factor for subsequent cannabis use in a recent 14-year follow-up study in the Netherlands (Ferdinand et al., 2005).

A recent study in Germany found that, in a sample of mid- to late adolescents, use of cannabis was predicted by a personality construct defined as 'addiction'. However, cannabis use was more likely among young people who scored low on a measure of anxiety–depression and that those who had a positive self-image were more likely to use cannabis (Kirkcaldy et al., 2004). The cannabis use measure in these analyses was lifetime use.

Investigation of 13- to 19-year-olds with diagnosed major depression, conduct disorder and substance dependence found that adolescents with major depression were more likely to develop cannabis dependence than adolescents whose depression manifested at the same time as substance dependence or whose depression developed subsequent to cannabis substance use disorder (Libby et al., 2005).

There are associations between various psychological and behavioural problems and problematic drug use including problematic cannabis use. In such cases, problematic cannabis use is in part symptomatic of psychological and behavioural problems and in part likely to exacerbate psychological and behavioural problems.

## Genetic factors

The epidemiology of drug use is increasingly informed by research into genetic influences and it appears that the role of genetic influences is greater for drug problems than for drug use (Kendler et al., 2003). But this is a complex issue and the specific genes involved and the nature of their interactions with environmental factors are issues for further research. Nonetheless, the distinction between drug use and escalation to drug problems appears to be in terms of the relative influence of genetic and environmental factors. Genetic risk factors are vulnerabilities for conditions that in turn increase the likelihood of developing drug problems (Moss et al., 2002). Both genetic and environmental influences are non-specific in their influence in terms of drugs that are used or with which users develop problems (Kendler et al., 2003).

Genetic factors interacted with family environmental factors in the origins of disruptive behaviour in a study of sons of substance and non-substance misusing families (Majumder et al., 1998). In substance-misusing families, sons with disruptive behaviour were influenced by parental dysfunction and family environment, while in non-substance-misusing families sons with disruptive behaviour were influenced by family environment. Family and social factors were related to cannabis initiation, while genetic factors influenced progression to problematic cannabis use in a study of twin girls (Kendler and Prescott, 1998).

Genetic influences account more for cannabis dependence than they do for cannabis use, while common environmental influences explained more cannabis use than cannabis dependence, supporting an individual vulnerability perspective on development of cannabis problems (van den Bree et al., 1998). Miles et al. (2001) found broadly equivalent genetic and environmental influences on cannabis use.

The genetic influence on cannabis use may be in terms of a genetic basis for sensation-seeking or problem behaviour, while genetic influence on problematic cannabis use may be in terms of a genetic basis for drug sensitivity and/or subjective reactions to cannabis (Agrawal and Lynskey, 2006). Genetic factors may explain in part why many cannabis users develop problematic cannabis use or escalation to drug problems of other kinds. While there will also be people with problematic cannabis use who are not at elevated genetic risk of substance-related problems, better understanding of how genetic factors are expressed and how they interact with environmental factors is a potentially valuable area of future research.

## Implications for prevention

In order to be successful, prevention interventions should address risk factors, taking into account the distinctions between cannabis use and problematic cannabis use, with

recognition that different kinds of prevention interventions will be required depending on the risk factors being tackled. Universal (primary prevention) programmes will in all likelihood not work with young people whose risk factor load is greater. Such young people, whose backgrounds include family strife, behavioural difficulties, and so on, will not only be less likely to gain from universal programmes due to their nature, they will be less likely to participate in them by, for example, being less likely to attend school.

Prevention of cannabis initiation has been attempted for many years in the context of universal drug education programmes with little or no success. These universal prevention interventions typically target entire populations of school pupils of specific ages, usually in early adolescence and more recently in pre-adolescence. Evaluation of the success of such programmes is usually defined as prevention of onset (primary prevention). Even the most successful of universal primary prevention drug education programmes have notably poor outcomes, with, at best, small-scale success (Coggans and Watson, 1995; Coggans et al., 2002; Tobler and Stratton, 1997; Advisory Council on the Misuse of Drugs, 2006). The more successful of these interventions attempt to influence aspects of social competence and self-esteem as well as drug-related knowledge and attitudes. Such attempts to promote social competence (life skills) could, in theory, ameliorate the risks of cannabis and other drug use by equipping young people with the skills to cope with a social environment that facilitates drug use. However, this type of primary prevention may work best with those young people who are less likely to escalate cannabis use to problematic levels. Moreover, at least one such programme does not impact on mediating life skills as expected (Coggans et al., 2002).

Given that the risk factors for experimental and recreational cannabis use are in many ways qualitatively different from the risk factors for problematic cannabis use, this lack of impact on cannabis initiation and on putative mediating factors is perhaps to be expected. However, those at risk of progression to problematic use may well benefit from interventions that aim to prevent escalation by addressing the psychological and behavioural factors that are risk factors for problematic use. However, such interventions require approaches targeted precisely at the individuals and groups at risk.

The recent report from the Advisory Council on the Misuse of Drugs (ACMD) (2006) concluded that the risk factors for hazardous drug use are early life experiences, family relationships and circumstances, and parental attitudes and behaviour. The ACMD also noted that it is not easy to predict who will develop serious problems. The role of parents is important, and many will not realise the extent of their potential role in the prevention of drug use problems and, most importantly, how to relate to their children in ways that maximise the influence of this central protective factor. While there is a growing awareness of the need for parent-oriented interventions, there have been few evaluations of drug education interventions aimed at parents. Positive impact



on mediating variables such as parent–child communication, normative beliefs and intentions to use has been reported, but there are also problems of low uptake and potential stigmatisation of higher-risk parents (Allot et al., 1999).

## Summary and conclusions

There is a complex of potential risk factors that interact with each other to compound and increase the risk of cannabis- and other drug-related problems. The weight of evidence is that risk factors for problematic cannabis use are, in large part, to be found in the interactions between genetic factors, the early nurturing of people and their circumstances. In many ways these are risk factors for substance-related problems generally. The evidence is accumulating for individual vulnerability to drug-related problems. While most cannabis users restrict their preferred drug use and can do so presumably on the basis of the absence of risk factors/presence of protective factors, others develop problematic relationships with drugs. Such problematic relationships with drugs include drug effects as risk factors for intensifying or precipitating psychological or social problems in turn.

The influence of risk factors is cumulative, both in terms of interaction with each other and in terms of time. The more that multiple risk factors accumulate over time the more likely that developmental and behavioural problems will become evident (Loxley et al., 2004). Behavioural problems, association with delinquent or deviant drug-using peers, dysfunctional family relationships, exposure to family substance misuse and genetic vulnerability to psychological conditions that increase the likelihood of drug problems all contribute to this complex of risk factors for problematic cannabis use. In the light of the varied, interactive and potentially confounding nature of risk factors for cannabis-related problems, prevention efforts need to be diverse. Universal programmes have a role to play in communicating key information and raising awareness of risks, but are unlikely to have any substantial impact on problematic cannabis users. Vulnerable groups and individuals require more precise targeting and delivery of programmes that will address their specific needs (see Burkhart, this monograph).

This chapter has drawn on a wide range of research literature assessing the role of various factors from the genetic to the social. Full justice will not have been done to the social and cultural differences across all the different settings in which the data were gathered for these research reports. To what extent are the conclusions justified without exploring these social and cultural contexts further? This is an empirical question. However, given the need to distinguish between recreational and problematic cannabis use in relation to the utility of the risk factors approach, it may be that there is a need to make the same distinction for other drugs as well. The potential for the risk factors approach to inform prevention efforts will depend in many respects on greater

understanding of the social norms and cultural factors related to recreational and problematic patterns of drug use.

## Bibliography

- Advisory Council on the Misuse of Drugs (2006), *Pathways to problems: hazardous use of tobacco, alcohol and other drugs by young people in the UK and its implications for policy*, UK Home Office, London.
- Agrawal, A., Lynskey, M. T. (2006), 'The genetic epidemiology of cannabis use, abuse and dependence', *Addiction* 101: 801–812.
- Allot, R., Paxton, R., Leonard, R. (1999), 'Drug education: a review of British Government policy and evidence of effectiveness', *Health Education Research* 14: 491–505.
- Amos, A., Wiltshire, S., Bostock, Y., Haw, S., McNeil, A. (2004), '"You can't go without a fag ... you need it for hash" — a qualitative exploration of smoking, cannabis and young people', *Addiction* 99: 77–81.
- Bauman, K. E., Ennett, S. T. (1996), 'On the importance of peer influence for adolescent drug use: commonly neglected considerations', *Addiction* 91: 185–198.
- Blaze-Temple, D., Lo, S. (1992), 'Stages of drug use: a community survey of Perth teenagers', *British Journal of Addiction* 87: 215–225.
- Bovasso, G. B. (2001), 'Cannabis use as a risk factor for depressive symptoms', *American Journal of Psychiatry* 158: 2033–2037.
- Boys, A., Marsden, J. (2003), 'Perceived functions predict intensity of use and problems in young polysubstance users', *Addiction* 98: 951–963.
- van den Bree, M. B. M., Pickworth, W. B. (2005), 'Risk factors predicting changes in marijuana involvement in teenagers', *Archives of General Psychiatry* 62: 311–319.
- van den Bree, M. B. M., Johnson, E. O., Neale, M. C., Pickens, R. W. (1998), 'Genetic and environmental influences on drug use and abuse/dependence in male and female twins', *Drug and Alcohol Dependence* 52: 231–241.
- Bukstein, O. G. (1995), 'Influences on the risk and course of substance use and abuse in adolescents', *Current Opinion in Psychiatry* 8: 218–221.
- Butters, J. E. (2002), 'Family stressors and adolescent cannabis use: a pathway to problem use', *Journal of Adolescence* 25: 645–654.
- Butters, J. E. (2004), 'The impact of peers and social disapproval on high-risk cannabis use: gender differences and implications for drug education', *Drugs: Education, Prevention and Policy* 11(5): 381–390.
- Campbell, M. J., Machin, D. (1999), *Medical statistics: a commonsense approach*, John Wiley & Sons, Chichester.
- Chabrol, H., Massot, E., Mullet, E. (2004), 'Factor structure of cannabis related beliefs in adolescents', *Addictive Behaviors* 29: 929–933.
- Chabrol, H., Ducongé, E., Casas, C., Roura, C., Carey, K. B. (2005), 'Relations between cannabis use and dependence, motives for cannabis use and anxious, depressive and borderline symptomatology', *Addictive Behaviors* 30: 829–840.
- Chen, C.-Y., Anthony, J. C. (2003), 'Possible age-associated bias in reporting of clinical features of drug dependence: epidemiological evidence on adolescent-onset marijuana use', *Addiction* 98: 71–82.
- Chen, K., Sheth, A. J., Elliott, D. K., Yeager, A. (2004), 'Prevalence and correlates of past-year substance use, abuse, and dependence in a suburban community sample of high-school students', *Addictive Behaviors* 29: 413–423.



## Risk factors for cannabis use

- Chen, C. Y., O'Brien, M. S., Anthony, J. C. (2005), 'Who becomes cannabis dependent soon after onset of use? Epidemiological evidence from the United States: 2000–2001', *Drug and Alcohol Dependence* 79: 11–22.
- Chilcoat, H. D., Dishion, T. J., Anthony, J. C. (1995), 'Parent monitoring and the incidence of drug sampling in urban elementary school children', *American Journal of Epidemiology* 141: 25–31.
- Clark, D. B., Kirisci, L., Moss, H. B. (1998a), 'Early adolescent gateway drug use in sons of fathers with substance use disorders', *Addictive Behaviors* 23(4): 561–566.
- Clark, D. B., Kirisci, L., Tarter, R. E. (1998b), 'Adolescent versus adult onset and the development of substance use disorders in males', *Drug and Alcohol Dependence* 49: 115–121.
- Coffey, C., Lynskey, M., Wolfe, R., Patton, G. C. (2000), 'Initiation and progression of cannabis use in a population-based Australian adolescent longitudinal study', *Addiction* 95: 1679–1690.
- Coggans, N., McKellar, S. (1994), 'Drug use amongst peers: peer pressure or peer preference?' *Drugs: Education, Prevention and Policy* 1(1): 15–26.
- Coggans, N., Watson, J. (1995), 'Drug education: approaches, effectiveness and delivery', *Drugs: Education, Prevention and Policy* 2(3), 115–128.
- Coggans, N., Cheyne, B., McKellar, S. (2002), *Effectiveness of the LifeSkills Training drug education and prevention programme*, Scottish Executive Effective Interventions Unit, Edinburgh.
- Coggans, N., Dalgarno, P., Johnson, L., Shewan, D. (2004), 'Long-term heavy cannabis use: implications for health education', *Drugs: Education, Prevention and Policy* 11(4): 299–313.
- Dobkin, P. L., Tremblay, R. E., Masse, L. C., Vitaro, F. (1995), 'Individual and peer characteristics in predicting boys' early onset of substance abuse: a seven-year longitudinal study', *Child Development* 66(4): 1198–1214.
- Ennett, S. T., Flewelling, R. L., Lindrooth, R. C., Norton, E. C. (1997), 'School and neighborhood characteristics associated with school rates of alcohol, cigarette and marijuana use', *Journal of Health and Social Behavior* 38: 55–71.
- Farrell, A. D., Danish, S. J. (1993), 'Peer drug associations and emotional restraint: causes or consequences of adolescents' drug use?', *Journal of Consulting and Clinical Psychology* 61: 327–334.
- Ferdinand, R. F., Sondeijker, F., van der Ende, J., Selten, J.-P., Huizink, A., Verhulst, F. C. (2005), 'Cannabis use predicts future psychotic symptoms, and vice versa', *Addiction* 100: 612–618.
- Fergusson, D. M., Horwood, L. J. (1997), 'Early onset cannabis use and psychosocial adjustment in young adults', *Addiction* 92: 279–296.
- Fergusson, D. M., Horwood, L. J. (2000), 'Prospective childhood predictors of deviant peer affiliations in adolescence', *Journal of Child Psychology and Psychiatry* 40(4): 581–592.
- Filozof, E. M., Albertin, H. K., Jones, C. R., Sterne, S. S., Myers, L., McDermott, R. J. (1998), 'Relationship of adolescent self-esteem to selected academic variables', *Journal of School Health* 68: 68–72.
- Foxcroft, D. R., Lowe, G. (1995), 'Adolescent drinking, smoking and other substance use involvement: links with perceived family life', *Journal of Adolescence*, 18: 159–177.
- Hawkins, J. D., Catalano, R. F., Miller J. Y. (1992), 'Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention', *Psychological Bulletin* 122: 64–105.
- Henquet, C., Krabbendam, L., Spauwen, J., Kaplan, C., Lieb, R., Wittchen, H.-U., van Os, J. (2004), 'Prospective cohort study of cannabis use, predisposition for psychosis, and psychotic symptoms in young people', *British Medical Journal* 330: 11–14.
- Hops, H., Davis, B., Lewin, L. M. (1999), 'The development of alcohol and other substance use: a gender study of family and peer context', *Journal of Studies on Alcohol, Suppl.* 13: 22–31.
- House of Lords Select Committee on Science and Technology (1998), *Cannabis: the scientific and medical evidence*, The Stationery Office, London.



- Kandel, D. B. (1996), 'The parental and peer contexts of adolescent deviance: an algebra of interpersonal influences', *Journal of Drug Issues* 26: 289–315.
- Kandel, D. B., Faust, R. (1975), 'Sequences and stages in patterns of adolescent drug use', *Archives of General Psychiatry* 32: 923–932.
- Kandel, D. B., Yamaguchi, K., Chen, K. (1992), 'Stages of progression in drug involvement from adolescence to adulthood: further evidence for the gateway theory', *Journal of Studies on Alcohol* 53: 447–457.
- Kendler, K. S., Prescott, C. A. (1998), 'Cannabis use, abuse, and dependence in a population-based sample of female twins', *American Journal of Psychiatry* 160: 687–695.
- Kendler, K. S., Jacobson, K. C., Prescott, C. A., Neale, M. C. (2003), 'Specificity of genetic and environmental risk factors for use and abuse/dependence of cannabis, cocaine, hallucinogens, sedatives, stimulants, and opiates in male twins', *American Journal of Psychiatry* 155: 1016–1022.
- King, S. M., Iacono, W. G., McGue, M. (2004), 'Childhood externalizing and internalizing psychopathology in the prediction of early substance use', *Addiction* 99: 1548–1559.
- Kirkcaldy, B. D., Siefen, G., Surall, D., Bischoff, R. J. (2004), 'Predictors of drug and alcohol abuse among children and adolescents', *Personality and Individual Differences* 36: 247–265.
- Kosterman, R., Hawkins, J. D., Guo, J., Catalano, R. F., Abbott, R. D. (2000), *American Journal of Public Health* 90(3): 360–366.
- Lewinsohn, P. M., Rohde, P., Brown, R. A. (1999), 'Level of current and past adolescent cigarette smoking as predictors of future substance use disorders in young adulthood', *Addiction* 94: 913–921.
- Libby, A. M., Orton, H. D., Stover, S. K., Riggs, P. D. (2005), 'What came first, major depression or substance use disorder? Clinical characteristics and substance use comparing teens in a treatment cohort', *Addictive Behaviors* 30(9): 1649–1662.
- Lloyd, C. (1998), 'Risk factors for problem drug use: identifying vulnerable groups', *Drugs: Education, Prevention and Policy* 5(3): 217–232.
- Loxley, W., Toumbourou, J. W., Stockwell, T., Haines, B., Scott, K., Godfrey, C., Waters, E., Patton, G., Fordham, R., Gray, D., Marshall, J., Ryder, D., Saggars, S., Sanci, L., Williams, J. (2004), *The prevention of substance use, risk and harm in Australia: a review of the evidence*, The National Drug Research Centre and the Centre for Adolescent Health, Canberra.
- Lynskey, M. T., Fergusson, D. M., Horwood, L. J. (1998), 'The origins of the correlations between tobacco, alcohol, and cannabis use during adolescence', *Journal of Child Psychology and Psychiatry* 39(7): 995–1005.
- Lynskey, M. T., Coffey, C., Degenhardt, L., Carlin, J. B., Patton, G. (2003a), 'A longitudinal study of the effects of adolescent cannabis use on high school completion', *Addiction* 98: 685–692.
- Lynskey, M. T., Heath, A. C., Bucholz, K. K., Slutske, W. S., Madden, P. A. F., Nelson, E. C., Statham, D. J., Martin, M. G. (2003b), 'Escalation of drug use in early-onset cannabis users vs co-twin controls', *Journal of the American Medical Association* 289: 427–433.
- Mackesy-Amity, M. E., Fendrich, M., Goldstein, P. J. (1997), 'Sequence of drug use among serious drug users: typical vs atypical progression', *Drug and Alcohol Dependence* 45: 185–196.
- McArdle, P., Wieggersma, A., Gilvarry, E., Kolte, B., McCarthy, S., Fitzgerald, M., Brinkley, A., Blom, M., Stoeckel, I., Pierolini, A., Michels, I., Johnson, R., Quensel, S. (2002), 'European adolescent substance use: the roles of family structure, function and gender', *Addiction* 97: 329–336.
- McGue, M., Iacono, W. G., Legrand, L., Malone, S., Elkins, I. (2001), 'The origins of age at first drink: I. Associations with substance-use disorders, disinhibitory behavior and psychopathology, and P3 amplitude', *Alcoholism: Clinical and Experimental Research* 25: 1156–1165.
- McIntosh, J., Gannon, M., McKeganey, N., MacDonald, F. (2003), 'Exposure to drugs among pre-teenage schoolchildren', *Addiction* 98: 1615–1623.

- McKeganey, N., McIntosh, J., MacDonald, F., Gannon, M., Gilvarry, E., McArdle, P., McCarthy, S. (2004), 'Preteen children and illegal drugs', *Drugs: Education, Prevention and Policy* 11(4): 315–327.
- Majumder, P. P., Moss, H. B., Murrelle, L. (1998), 'Familial and nonfamilial factors in the prediction of disruptive behaviours in boys at risk for substance abuse', *Journal of Child Psychology and Psychiatry* 39(2): 203–213.
- Merikangas, K. R., Dierker, L. C., Szatmari, P. (1998), 'Psychopathology among offspring of parents with substance abuse and/or anxiety disorders: a high-risk study', *Journal of Child Psychology and Psychiatry* 39(5): 711–720.
- Miles, D. R., van den Bree, M. B. M., Gupman, A. E., Newlin, D. B., Glantz, M. D., Pickens, R. W. (2001), 'A twin study on sensation seeking, risk taking behavior and marijuana use', *Drug and Alcohol Dependence* 62: 57–68.
- Miller, P., Plant, M. (2002), 'Heavy cannabis use among UK teenagers: an exploration', *Drug and Alcohol Dependence* 65: 235–242.
- Monshouwer, K., Smit, F., Verdurmen, J. (2006), 'Polydrug and cannabis use among secondary school students in the Netherlands: combinations, prevalences and risk-profiles', this monograph.
- Morrall, A. M., McCaffrey, D. F., Paddock, S. M. (2002), 'Reassessing the marijuana gateway effect', *Addiction* 97: 1493–1504.
- Moss, H. B., Lynch, K. G., Hardie, T. L., Baron, D. A. (2002), 'Family functioning and peer affiliation in children of fathers with antisocial personality disorder and substance dependence: associations with problem behaviours', *American Journal of Psychiatry* 159: 607–614.
- Patton, G. C., Coffey, C., Carlin, J. B., Sawyer, S. M., Lynskey, M. (2005), 'Reverse gateways? Frequent cannabis use as a predictor of tobacco initiation and nicotine dependence', *Addiction* 100(10):1518–1525.
- Pederson, W., Mastekaasa, A., Wichstrøm, L. (2001), 'Conduct problems and early cannabis initiation: a longitudinal study of gender differences', *Addiction* 96: 415–431.
- Peele, S., Brodsky, A. (1997), 'Gateway to nowhere: how alcohol came to be scapegoated for drug use', *Addiction Research* 5: 419–426.
- Pope, H. G., Gruber, A. J., Hudson, J. I., Cohane, G., Huestis, M. A., Yurgelun-Todd, D. (2003), 'Early-onset cannabis use and cognitive deficits: what is the nature of the association?', *Drug and Alcohol Dependence* 69: 303–310.
- Rhodes, T., Lilly, R., Fernández, C., Giorgino, E., KEMMESIS, U. E., Ossebard, H. C., Lalm, N., Faasen, I., Spannow, K. E. (2003), 'Risk factors associated with drug use: the importance of "risk environment"', *Drugs: Education, Prevention and Policy* 10(4): 303–329.
- Schroeder, D. S., Laflin, M. T., Weis, D. L. (1993), 'Is there a relationship between self-esteem and drug use? Methodological and statistical limitations of the research', *Journal of Drug Issues* Fall 1993: 645–665.
- Solowij, N., Stephens, R. S., Roffman, R. A., Babor, T., Kadden, R., Miller, M., Christiansen, K., McRee, B., Vendetti, J. (2002), 'Cognitive functioning of long-term heavy cannabis users seeking treatment', *Journal of the American Medical Association* 287: 1123–1131.
- Sutherland, I., Willner, P. (1998), 'Patterns of alcohol, cigarette and illicit drug use in English adolescents', *Addiction* 93: 1199–1208.
- Swadi, H. (1999), 'Individual risk factors for adolescent substance use', *Drug and Alcohol Dependence* 55: 209–224.
- Swift, W., Copeland, J., Hall, W. (1998), 'Choosing a diagnostic cut-off for cannabis dependence', *Addiction* 93(11): 1681–1692.
- von Sydow, K., Lieb, R., Pfister, H., Höfler, M., Sonntag, H., Wittchen, H.-U. (2001), 'The natural course of cannabis use, abuse and dependence over four years: a longitudinal community study of adolescents and young adults', *Drug and Alcohol Dependence* 64: 347–361.





- Taylor, D. R., Poulton, R., Moffitt, T. E., Ramankutty, P., Sears, M. R. (2000), 'The respiratory effects of cannabis dependence in young adults', *Addiction* 95(11): 1669–1677.
- Tims, F. M., Dennis, M. L., Hamilton, N., Buchan, B. J., Diamond, G., Funk, R., Brantley, L. B. (2002), 'Characteristics and problems of 600 adolescent cannabis abusers in outpatient treatment', *Addiction* 97(Suppl. 1): 46–57.
- Tobler, N., Stratton, H. (1997), 'Effectiveness of school-based drug prevention programmes: a meta-analysis of the research', *Journal of Primary Prevention* 18(1): 71–128.
- Tot, S., Yazici, K., Yazici, A., Metin, Ö., Bal, N., Erdem, P. (2004), 'Psychosocial correlates of substance use among adolescents in Mersin, Turkey', *Public Health* 118: 588–593.
- Vega, W. A., Gil, A. G. (2005), 'Revisiting drug progression: long range effects of early tobacco use', *Addiction* 100: 1358–1369.
- Wells, J. E., Horwood, L. J., Fergusson, D. M. (2004), 'Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood', *Addiction* 99: 1529–1541.
- Wills, T., McNamara, G., Vaccaro, D., Hirky, A. E. (1996), 'Escalated substance use: a longitudinal grouping analysis from early to middle adolescence', *Journal of Abnormal Psychology* 105: 166–179.
- Witton, J. (2008), 'Cannabis use and physical and mental health', this monograph, Volume 2.





## Appendix: approaching cannabis research — a quick guide

### Approaching cannabis research — a quick guide

During the editing of this monograph, the EMCDDA soon realised that the publication was entering a crowded arena. Cannabis monographs appear several times a year in different languages. The core information they contain is being continuously revamped, revised, reworked, remixed or just repeated.

A concern for the Centre was to avoid the near-instant obsolescence of many cannabis monographs. This is why the publication takes a 'reader' approach, mapping current publication flows; sketching the history of cannabis monographs and identifying key sources for information. This appendix aims to (i) identify the main producers of literature on cannabis and (ii) illustrate the range in thematic focus of publications. In particular, it will help researchers who are new to the area or who are entering cannabis research from other disciplines (law, medicine, politics, sociology, etc.).

### Information overload on cannabis, and the need for a trusted guide

Any researcher requiring definitive, accurate information on cannabis needs to be forearmed. In the age of the Internet, any taboos that may previously have hushed discussion on illicit drugs have vanished. On the contrary, researchers are overwhelmed with data (Table 1). Like drinking water from a firehose, it becomes impossible to manage the sheer volume of insider guides, reports and general punditry on cannabis. Cannabis has even evolved to have its own portal on Wikipedia, alongside such all-encompassing subjects as science, history and medicine. A recent Spanish study on the use of the Internet for finding drugs over several months found that Spanish search engine registered 31 800 000 searches for the word 'cannabis', 481 000 for 'marihuana efectos' and 358 000 for 'cultivo de marihuana'.

Table 1: Basic internet search results (October 2006)

Internet search used	Search terms	Hits
Google	'cannabis', 'marihuana', 'marijuana'	18 400 000; 7 030 000; 26 900 000
Google Books	'Cannabis', 'marihuana', 'marijuana'	66 000; 46 400; 148 000
Google Books	'Cannabis 2006'	1 140
Google Scholar	'Cannabis', 'marihuana', 'marijuana'	94 500; 9 570; 112 000
PubMed	'Cannabis', 'marihuana', 'marijuana'	9 099; 6 000; 10 812
Bireme	'Cannabis'	3 723 (Medline); 462 (Cochrane); 270 (LILACS); 23 (SciELO)
Amazon.com books	'Cannabis', 'marihuana', 'marijuana'	8 539
Yahoo	'Cannabis', 'marihuana/marijuana' (!)	14 400 000; 30 500 000

(!) Yahoo tracks 'marihuana' and 'marijuana' as a single search term.

## Information exchange among cannabis experts: journals, conferences and community

Faced with such a huge amount of information, where does one begin? The first step is to be able to identify the producers of quality scientific information. Scientific publications on cannabis are by-and-large the product of constant information exchange among academics and governments. In addition to standard forums for research (e.g. PubMed- and Medline-listed journals<sup>(1)</sup>, HON-accredited websites) and annual cyclical publications<sup>(2)</sup>, there exists a well-attended circuit of face-to-face meetings with a domestic, regional and international scope<sup>(3)</sup>. An overview of websites focusing on drugs issues (NGOs, government campaigns) in Europe is provided by the Elisad Gateway. Some of these events focus purely on cannabis, but the majority discuss cannabis together with other illicit drugs, legal or healthcare topics. These cyclical meetings are increasingly bolstered by one-off conferences focusing on selected cannabis issues (legislation, treatment, medicinal cannabis, cannabinoid research). The result is a sizeable, yet close-knit network of global cannabis experts.

(1) An invaluable tool for the preparation of this monograph has been the open source referencing tool, *Jabref*, which offers fast searches and abstracts of *Medline* literature.

(2) Annual publications include: the UNODC's *World Drugs Report*, EMCDDA's *Annual Report* and Reitox national focal point reports, the ONDCP *Annual report*, SAMSHA's *National Survey on Drug Use and Health* and the NDIC's annual *National Drug Threat Assessment* in the USA.

(3) A useful information source for meetings with a European focus is the events section of EMCDDA's quarterly newsletter, *DrugNet Europe*.



## A hierarchy in expertise: the ‘cannabis research pyramid’

A three-tier pyramid can be created in terms of global expertise on the subject. On the bottom tier there are tens of thousands of practitioners: various healthcare and drugs professionals, together with employees of think tanks, charities and governments. To some extent, established lobbyist groups, for example NORML and EURAD, can be included in this tier. In the middle tier, there are some 2000 to 3000 cannabis experts working in research institutions. The majority of these are working directly with drugs issues. The top tier comprises around 200 to 300 leading authorities who are generally working at centres of excellence in cannabis research and playing an active role in informing government policy. The middle and top tiers are the typical publishers of general monographs on cannabis.

### Top tier: several hundred experts

Centres of excellence in cannabis research.

National and international drugs coordination centres.

International cannabis research societies, e.g. National Drug and Alcohol Research Centre, Australia; National Addiction Centre, UK; Trimbos Institute, the Netherlands; National Institute of Drugs Dependence, China; Centre for Addictions Research, Canada; Addiction Research Centre, Canada; The Institute for Clinical Research, Germany; Sociedad Española De Investigación Sobre Cannaboides, Spain; International Association for Cannabis as Medicine; European Association of Addiction Therapy; National Institute on Drug Abuse, USA.

### Middle tier: several thousand people worldwide

Drugs professionals specialising in cannabis: predominantly at national treatment centres and domestic centres of excellence.

Educational institutions involved in cannabis RCTs and testing.

Psychiatrists/treatment professionals working in a national advisory role on cannabis issues.

Commercial research laboratories involved in cannabis therapeutics.



## Appendix: Approaching cannabis research — a quick guide

Government policymakers working specifically on drugs control and legislation.

Law enforcement professionals with experience in cannabis control, arrests and seizures.

### **Bottom tier: tens of thousands of people worldwide**

Drugs professionals: local and regional treatment centres and clinics, prevention campaigns, drugs charities.

Healthcare practitioners: general practitioners, psychiatrists, psychologists.

Civil servants: working at government ministries, international organisations (UNODC, EMCDDA, WHO), healthcare providers.

Law enforcement: police, customs, international police organisations (Interpol, Europol), drug enforcement units (DEA).

Educational institutions: teaching centres, postgraduate and postdoctoral researchers.

Commercial research: medicinal cannabis and hemp industries.

Lobbyists: international think tanks (e.g. Pompidou Group, Senlis Council, RAND), domestic think tanks (e.g. Rowntree Foundation), legalisation lobbyists (NORML) and anti-legalisation lobbyists.

### **Core outputs of the pyramid: journals, commercial publishing, grey literature**

Outputs from this research pyramid are dominated by the so-called 'grey literature' — that is, publications by government departments, NGOs and international organisations (this monograph being no exception). Other publications include special issues in academic journals, publications by lobbyists, as well as commercially oriented books. On a more passive level, the pyramid also helps to inform the several hundred journalistic articles on cannabis published each day in the world's media by providing expert opinions, background information and quotes to the press. As such, the cannabis experts in the pyramid provide a useful calmative influence on a subject that is often discussed in alarmist, confrontational or heavily politicised tones. The outputs can

broadly be categorised into academic journals, commercial publications and grey literature.

## Journals

Scholarly research into cannabis appears many times per month across a variety of academic journals, in particular journals focused on drugs, psychiatry, public health, science and medicine, and increasingly those focusing on sociology, law and media studies (Table 2). There occasionally appear ‘special focus’ editions on cannabis in journals. Examples include *SWAPS — Spéciale Cannabis* (Pialoux (ed.), 2003), *Monográfico Cannabis — Revista Española de Drogodependencias Vol. 30* (AESED, 2003). A useful list of scientific journals publishing on drugs issues can be found using the members list of the International Society of Addiction Journal Editors (<http://www.parint.org/isajewebsite/>).

Table 2: A selection of academic journals regularly covering cannabis

Subject area	Journal titles
Drugs and addiction	<i>Addiction, Addictive Behaviours, American Journal of Addictions, British Journal of Addiction, Bulletin on Narcotics, Drug and Alcohol Dependence, Drug and Alcohol Review, Drugs: education, prevention and policy; European Addiction Research, Harm Reduction Journal, International Journal of Drug Policy, Italian Journal on Drug Addiction and Alcoholism (Bollettino per le Farmacodipendenze e L'alcoolismo), The International Journal of the Addictions, International Journal of Mental Health &amp; Addiction, Journal of Drug Issues, Prevention &amp; Policy, Journal of Substance Abuse Treatment, SWAPS, Revista Española de Drogodependencias, Substance Use and Misuse, THS — La revue des addictions, The Cannabis Health Journal, Wiener Zeitschrift für Suchtforschung</i>
Psychiatry	<i>British Journal of Psychiatry, The American Journal of Psychiatry, Psychotropes</i>
Neurology	<i>Brain, Neurology, Neuropharmacology, Psychopharmacology</i>
Science	<i>Nature, New Scientist</i>
Medicine and pharmacology	<i>Annales de toxicologie analytique, Annales pharmaceutiques françaises, Clinical Pharmacology and Therapeutics, Journal of the American Medical Association, Journal of Cannabis Therapeutics, Cannabinoids: The Journal of the International Association for Cannabis as Medicine (2001–2004), Journal of Pharmacy and Pharmacology, The Lancet, British Medical Journal, European Journal of Clinical Pharmacology</i>
Sociology	<i>The Humanist, Journal of Sociology and Social Welfare</i>
Law and criminology	<i>The Cambridge Law Journal, European Journal on Criminal Policy and Research, Forensic Science International, International Journal of Drug Testing, Journal of Police Science and Management, European Review, Policy Review, Vanderbilt Journal of Transnational Law</i>



## Commercial publishing

Outside academia, cannabis has sparked what can only be termed a publishing phenomenon in the past two decades, embracing all bookselling genres (Table 3). There have been novels and literary anthologies, political tracts, dedicated magazines such as *The High Times*, connoisseurship columns in mainstream magazines and newspapers, product and cultural histories, biographies (by traffickers, drugs detectives, musicians, actors), practical growguides, cannabis-oriented travel guides and cookbooks, not to mention a wealth of educational and harm reduction materials. While some of these are found only at headshops and specialised booksellers, others have entered bestseller lists. Cannabis, it seems, is a mainstream topic that attracts a commercially viable readership.

## Grey literature

As mentioned above, grey literature producers, such as NGOs and government agencies, are significant publishers of information on cannabis. The appendix to Volume 1 of this monograph provides a selection of key grey literature publications on cannabis published in recent years. Naturally, this list is non-exhaustive, yet it remains valuable for researchers. Just as this monograph is unlikely to be the last specialised publication on cannabis for the EMCDDA, so will peer organisations revisit the topic as issues of science, data and policy evolve.



**Table 3: A selection of recent books published on cannabis in three genres and three languages (genres: history, society/politics, health/medicine; languages: English (EN), French (FR), German (DE))**

History	<i>Cannabis: a history</i> (Booth, 2003) (EN)
	<i>Cannabis: from pariah to prescription</i> (Russo (ed), 2003) (EN)
	<i>Cannabis. Hanf, Hemp, Chanvre, Canamo</i> (Bröckers, 2002) (DE)
	<i>Cannabis Britannica: empire, trade, and prohibition</i> (Mills, 2003) (EN)
	<i>Cannabis on the brain</i> (Smith, 2002) (EN)
Society/politics	<i>Marijuana for dopes: a pop culture history of cannabis</i> (Romain, 2001) (EN)
	<i>Cannabis</i> (Green, 2002) (EN)
	<i>Cannabis: le dossier</i> (Chollet-Przednowed, 2003) (FR)
	<i>Cannabis. Neue beiträge zu einer alten diskussion</i> (Gaßmann, 2004) (EN)
	<i>Cannabis, ecstasy: du stigmaté au déni. Les deux morales des usages récréatifs de drogues illicites</i> (Peretti-Watel, 2005) (FR)
	<i>Cannabis ist immer anders</i> (Kuntz, 2005) (DE)
	<i>Cannabis use and dependence: public health and public policy</i> (Hall and Pacula, 2002) (EN)
	<i>Le cannabis en question</i> (Palazzolo, 2006) (FR)
	<i>Orgies of the hemp eaters: cuisine, slang, literature and ritual of cannabis culture</i> (Bey and Zug (ed.), 2005) (EN)
	<i>Spliffs: a celebration of cannabis culture</i> (Jones, 2004) (EN)
	<i>Spliffs 2: further adventures in cannabis culture</i> (Pilcher, 2005) (EN)
	<i>The cannabis debate</i> (Donnellan (ed.), 2004) (EN)
	<i>The complete illustrated guide to cannabis</i> (Brownlee, 2003) (EN)
	<i>Un écran de fumée: le cannabis dans la famille</i> (Bantman and Hefez, 2005) (FR)
	<i>Understanding marijuana: a new look at the scientific evidence</i> (Earlywine, 2005) (EN)
Health/ medicine	<i>Cannabinoids as therapeutics</i> (Mechoulam (ed.), 2005) (EN)
	<i>Cannabis et santé</i> (Raynaud, 2004) (FR)
	<i>Cannabis und cannabinoide. pharmakologie, toxikologie und therapeutisches potenzial</i> (Grotenhermen, 2005) (DE)
	<i>Halte au cannabis</i> (Costentin, 2006) (FR)
	<i>Le cannabis: et les autres drogues</i> (Benyamina and de Paillette, 2005) (FR)
	<i>Management of alcohol and drug problems</i> (Hulse, White and Cape, 2002) (EN)
	<i>Marijuana and madness</i> (Castle and Murray (eds), 2004) (EN)
<i>Wenn cannabis der seele schadet: Hilfe bei Sucht und psychischen Störungen</i> (Lindberg and Haasen, 2005) (DE)	





# Index

The index below covers both volumes of this monograph. Volume number is denoted by the principal number in the index entry, e.g. 'absorption' can be found on p. 33 of Volume 1.

## A

absorption 1.33  
abuse 2.33–4  
Acompla *see* rimonabant  
action plan on drugs *see* European Union  
activist groups 1.88  
adolescents 2.3–26, 2.79–95, 2.332  
    correlates of consumption 2.74–7  
    screening tests 2.39–40  
    treatment 2.209  
    *see also* ESPAD; students  
advertising 2.224  
Advisory Committee on Drug Dependence 1.44, 1.46  
advocacy 2.97–110  
affordability 1.76–7  
    *see also* economic accessibility  
age 2.287  
agonists 1.19  
AHOJ-G criteria 1.141  
    *see also* environmental strategies  
ALAC 2.53  
alcohol 2.79, 2.330–1  
    health effects 2.151  
    prevalence 2.85–6  
    *see also* harm indices  
alcohol policy 1.122–3  
    alternatives to prohibition 1.125–6  
    consumption after legalisation 1.125  
    and potency 1.127–8  
    rationing system 1.126–7  
Alcohol Use Disorders Identification Test (AUDIT) 2.36  
Algeria 1.262  
amotivational syndrome *see* psychological effects

amphetamines 1.54, 1.56, 1.74, 2.63, 2.79  
    prevalence 2.85–6  
Amsterdam 1.138, 1.142, 1.143–5, 1.151, 1.152, 1.204, 2.39  
anandamide 1.19  
anasha 1.67  
antagonists 1.19  
anthropology 2.97–110  
antiemetic use 2.165  
anxiety 2.133–4  
    *see also* mental health  
2-arachidonoyl glycerol 1.19  
Austria 1.232–3  
    consumption of cannabis products 1.250  
    potency of cannabis 1.245, 1.251  
availability 1.75–6, 2.64  
    current indicators 1.218–20  
    definition of 1.218  
    Europe 1.215–36  
    global 1.218  
    perceived 1.230–1, 1.232–3, 2.72  
    street-level 1.218  
    *see also* supply  
awareness 2.63–4

## B

back door problem (coffee shops) 1.151–2  
Baltic States 1.65, 1.68, 1.76, 1.78, 1.79, 1.87–8, 1.90, 1.91  
Balzac, Honoré de 1.6  
Baudelaire, Charles 1.6  
Beatles, the 1.44  
Becker, Howard S. 2.109  
Bedrocan 1.23



## Index

- behaviour 2.97–110
- behavioural effects 2.189–90
- Belgium 1.232–3
  - consumption of cannabis products 1.250
  - Maat in de Shit programme 2.222
  - see also Flanders
- Beron, Basilus 1.7
- bhang* 1.7
- Bibra, Ernst Freiherr von 1.8
- bongs see waterpipes
- botanic classification 1.32
- box-score reviews 2.205–7
- Bromidia* 1.9
- buckets 1.178–9
- bupropion 2.212
- Burroughs, William 2.115
- C**
- CAGE test 2.36, 2.39, 2.43, 2.48
- Callaghan, James 1.47
- Canada 1.22
- CANDIS 2.212
- cannabichromene 1.32
- cannabidiol 1.32, 1.243
- cannabigerol 1.32
- cannabindon 1.9
- cannabinoids 1.17–24
  - detection of 2.189
  - effects of 1.28
  - pharmacology 1.17–24, 1.27–37
- cannabinol 1.243
- Cannabium tannicum* Merck 1.8
- Cannabis: the Scientific and Medical Evidence* 1.20
- cannabis
  - as medicine 1.3–14
  - psychoactive properties 1.5, 1.66–7
- Cannabis Abuse Screening Test (CAST) 2.40, 2.43, 2.53
- cannabis clubs 1.23
- cannabis flos 1.256
- Cannabis indica* 1.8
- cannabism 1.10
- cannabis oil 1.191
  - trafficking 1.279–80
- cannabis plants
  - seizures 1.221
  - see also herbal cannabis
- Cannabis Problems Questionnaire 2.40
- cannabis resin 1.5, 1.30, 1.73, 1.84, 1.100
  - commodity chain 1.269–70
  - export 1.272–84
  - growth of trade 1.272–3
  - lifetime experience 2.66–7, 2.71
  - potency 1.228, 1.230
  - prices 1.225
  - production 1.199–203, 1.264
  - production/manufacture 1.265–71
  - seizures 1.221
  - sources of 1.200
  - trafficking 1.208–9, 1.278
  - see also Morocco
- Cannabis sativa* L. 1.30
- Cannabis Use Disorders Identification Test (CUDIT) 2.38, 2.43, 2.47
- Cannador 1.22
- carcinogenicity 2.121–4
  - childhood cancers 2.123–4
  - respiratory cancer 2.121–3
- CARED study 2.310
- CB1 see receptors
- CB2 see receptors
- Cesamet capsules 1.21
- charras* 1.7
- chemical structure 1.243
- childhood cancers 2.123–4
- Christchurch Health and Development Study 2.130–1
- Christiania 1.157, 1.159
  - charges 1.164
  - Intelligence Service 1.162–3
  - pre-trial detention 1.163–4
  - Pusher Street 1.157, 1.159–60, 1.162–3
  - trials and sentences 1.165
- classification 1.105, 1.110–11
- clubbers see recreational settings
- cocaine 1.74, 2.79
  - prevalence 2.85–6
- Cocaine Craving Questionnaire 2.41
- Cochrane Collaboration 2.251
- coffee shops 1.113, 1.129, 1.137–58
  - back door problem 1.151–2
  - policy options 1.151–2
  - restricted role of 1.149–51
- collision risk 2.177–88
- communication 1.174–5
- comorbidity 2.115–40
- competition 1.286–7
- Composite International Diagnostic Interview (CIDI) 2.36
- concealed use 2.101–2
  - means of concealment 2.102–3
- consumption 1.250
  - after legalisation 1.125
  - correlates in adolescents 2.74–7
  - and perceived availability 2.72–4
  - relative 1.253
  - and risk perception 2.74
- consumption techniques see mode of administration



- contingency management 2.210–11  
continuation (conversion) rate 2.16–17  
controls see legislation  
controlling use 2.103  
Convention on Narcotic Drugs (1961) 1.11  
convictions 1.41, 1.43  
Copenhagen 1.157–72  
Council of Europe 1.293–5  
Courtive, Edmond de, *Haschish* 1.6  
crack 1.74  
crackdown 1.157–72  
crime  
    disorganised 1.286–7  
    smuggling see trafficking  
    see also legislation  
Criminal Justice Act (1977) 1.48  
criminal justice system 2.232–3  
culpability index 2.184  
cultivation see production  
culture of silence 2.104  
current use 2.7, 2.11–12, 2.14, 2.15, 2.29  
    measurement of 2.7–8  
    medicinal 1.11–12, 1.17–24  
Cyprus 1.232–3  
    availability 1.75  
    drug seizures 1.82, 1.83  
    herbal cannabis buying power 1.77  
    legislation 1.80  
    lifetime prevalence 1.66, 1.68, 1.71  
Czech Republic 1.232–3  
    availability 1.75  
    consumption of cannabis products 1.250  
    drug seizures 1.82, 1.83  
    herbal cannabis buying power 1.77  
    legislation 1.80  
    lifetime prevalence 1.67, 1.68, 1.70  
    potency of cannabis 1.245, 1.251
- D**  
Dangerous Drugs Act (1928) 1.41  
data presentation 1.253–4  
Daumier, Honoré 1.6  
debut drugs 2.69–70  
    see also gateway theory, initiation  
decriminalisation 1.97–117  
    and cannabis use 1.145–9  
demand 1.273–4  
demand reduction 1.85–7  
Denmark 1.157–72, 1.232–3  
    Hash-Club Law 1.160  
    legislation 1.160–6  
depenalisation 1.87, 1.88, 1.121, 1.125  
dependence 2.16, 2.33, 2.37, 2.126–7, 2.150  
    physiological 2.34  
    psychological 2.34  
depression 2.133–4  
Deutsche Hauptstelle für Suchtfragen  
    (Germany) 1.307  
deviance 2.97–110  
Diagnostic Interview for Genetic Studies  
    (DIGS) 2.38  
Dib, H'midou 1.270  
discos and bars 2.65  
distribution 1.275–6  
    middle-tier network 1.281  
    multiregional 1.280  
    smallest unit 1.279  
divalproex 2.212  
domestic production 1.253  
Donovan 1.44  
dopamine 1.31, 1.35  
dopaminergic system 1.35  
Dragendorff, Johan Georg 1.9  
driving 2.173–98  
    assessment of behavioural effects 2.189–90  
    collision risk 2.177–88  
    effects on performance 2.175–7  
dronabinol 1.20–1, 1.105, 1.106  
drug policy 2.157–71  
drug recognition experts 2.189  
DrugScope 1.174  
drug use progression 2.329–30  
DSM-IV 2.33, 2.35, 2.37, 2.45–6  
Dumas, Alexandre 1.6  
Dunedin Multidisciplinary Health and  
    Development Study 2.129–30  
Dutch drug policy see Netherlands  
Dutch National School Survey 2.79–95  
dysphoria 1.28, 2.119  
dysthymic disorder 2.316, 2.317
- E**  
Early Developmental Stages of Psychopathology  
    (EDSP) study 2.131  
early intervention 2.279–95  
early onset use 2.70  
economic accessibility 1.76–7  
economics 1.119–35  
economies of scale 1.287  
ecstasy 1.74, 2.63, 2.79  
    prevalence 2.85–6  
    polydrug use with cannabis 2.85–6  
EDDRA database 2.234  
education 1.174–5, 2.219–21  
Egypt, legislation 1.100–1  
EMCDDA 1.53, 1.111, 1.187, 2.3–26, 2.32,  
    2.144  
    EDDRA database 2.234  
    PERK project 2.225, 2.227



## Index

- endocannabinoids 1.19, 1.27, 1.30, 1.31, 1.34–6  
environmental prevention strategies 1.119–35, 2.220, 2.223–4  
  see also alcohol, tobacco  
epidemiology 1.66–77, 2.3–26, 2.59–77, 2.79–95  
ESPAD 1.67–9, 1.231, 1.294, 2.23, 2.59–77  
Estonia 1.232–3  
  availability 1.75  
  consumption of cannabis products 1.250  
  drug seizures 1.82, 1.83  
  herbal cannabis buying power 1.77  
  legislation 1.80  
  lifetime prevalence 1.67, 1.68, 1.71, 1.73  
Europe  
  availability of cannabis 1.215–36  
  cannabis use 2.19–21  
  importing 1.272–84  
  legislation 1.97–117  
  medicinal use of cannabis 1.3–14  
  potency of cannabis 1.239–62  
  recent trends 2.21–4  
  supply and market factors 1.291–7  
  treatment demand 2.261–76  
  see also individual countries  
European Union 1.110–12, 2.3–26  
  classification 1.110–11  
  new Member States 1.63–93  
  personal use 1.111–12  
event analysis 1.274  
Evidence-based Electronic Library for Drugs and Addiction 1.172  
experimentation 2.7  
expert knowledge 1.124–5, 2.349–53  
export prices 1.268  
exports see imports/exports  
exposure score 1.294  
*Extractum Cannabis indicae* 1.8
- F**  
family approaches to prevention 2.230, 2.333–4  
farm prices 1.268  
Finland 1.232–3, 2.97–110  
First International Opium Conference 1.101  
Flanders 1.304  
  see also Belgium  
Flaubert, Gustave 1.6  
flower power 1.45  
France 1.8, 1.9, 1.232–3  
  potency of cannabis 1.245, 1.248  
free radicals 1.31  
Fronmüller, Bernhard 1.8
- G**  
ganglia 1.31  
*ganjah* 1.7  
  see also herbal cannabis  
gateway theory 1.77, 2.60, 2.92, 2.93, 2.223, 2.329–31, 2.335  
Gauthier, Théophile 1.6  
gender 1.71, 2.287  
  and cannabis use 2.18–19, 2.69  
  and prevention programmes 2.228  
  and trafficking 1.278  
generation effect 1.149, 2.22  
genetic factors 2.338  
Germany 1.8, 1.22, 1.232–3  
  consumption of cannabis products 1.250  
  Deutsche Hauptstelle für Suchtfragen 1.308  
  legislation 1.100  
  potency of cannabis 1.245, 1.247, 1.251  
  *Quit the Shit* programme 2.222  
  treatment demand 2.305–23  
glaucoma 1.12  
global availability 1.218  
government monopoly system 1.126  
  effectiveness of 1.127  
  see also environmental prevention strategies  
Greece 1.232–3  
  legislation 1.100–1  
grey literature 12.300–10  
GW Pharmaceuticals 1.21
- H**  
Hachichins, Club des 1.6  
Hahnemann, Samuel 1.7  
hallucinogens 2.79  
harmful use 2.33  
harm indices see classification  
harm potential 2.147–52  
harm reduction 1.171–83  
  definition of 1.173–4  
  health-related 1.174–80  
harm risk 2.146–7  
Hash-Club Law 1.160, 1.161  
hashish see cannabis resin  
Hassela pedagogic 1.58  
health benefits 2.164–5  
health effects 1.106–7, 2.115–40, 2.157–71  
  acute 2.118–20, 2.160–1  
  carcinogenicity 2.121–4  
  cardiovascular 2.119  
  causal inferences 2.159–60, 2.162–3  
  chronic 2.120–1, 2.161–2  
  dependence 2.16, 2.33, 2.37, 2.126–7  
  immune system 2.120  
  improved assessments 2.166–7



mood 2.119–20  
premature mortality 2.125–6  
prenatal cannabis exposure 2.124–5  
reproductive system 2.124  
respiratory system 2.120  
  see also public health impact  
health impact assessment 2.143  
hemp 1.5, 1.6–7, 1.8  
Hemp Seed Association 1.88  
*Herba Cannabis indicae* 1.8  
herbal cannabis 1.73, 1.76–7, 1.84  
  lifetime experience 2.66–7, 2.71  
  potency 1.228, 1.229, 1.230  
  prices 1.226  
  production 1.192–8  
  seizures 1.221–2  
  THC in 1.249  
  trafficking 1.206–7  
heroin 2.79  
  health effects 2.151  
  prevalence 2.85–6  
  supply model 1.294  
hippie era 1.45, 1.59, 1.67, 1.159  
history 1.3–14, 1.99–100  
  new EU Member States 1.66  
HIT 1.174  
homeopathy 1.7  
house dealers 1.141  
Hugo, Victor 1.6  
Hungarian Civil Liberties Union 1.88  
Hungary 1.232–3  
  availability 1.75  
  drug seizures 1.82, 1.83, 1.84  
  herbal cannabis buying power 1.77  
  legislation 1.81  
  lifetime prevalence 1.67, 1.68, 1.70, 1.71

**I**  
ICD-10 2.37, 2.313–14  
immune effects 2.120  
imports/exports 1.272–84  
  large-scale 1.281  
  see also trafficking  
India 1.99–100  
Indian hemp see hemp  
*Indian Hemp Report* (1894) 1.9  
indicated prevention 2.220, 2.235  
information 1.174–5  
inhalants 2.79  
initiation (age of first use) 2.267–8, 2.331–2  
intensive use 2.14–17, 2.34  
  continuation rates 2.16–17  
  current 2.14  
  daily 2.14–16  
  dependence/problematic use 2.16

international law 1.102–4  
intoxication 2.148  
Ireland 1.232–3  
  consumption of cannabis products 1.250  
ISD-10 2.33  
Italy 1.22, 1.232–3  
Iversen, Leslie 1.20

**J**

Jagger, Mick 1.44, 1.45, 1.48  
jazz scene 1.43, 1.44, 1.53, 1.55, 1.142–3  
Jellinek Clinic (the Netherlands) 2.39  
Jellinek self-screening test 1.171, 2.39  
  see also, *Know Cannabis* test  
Joseph Rowntree Foundation 1.302, 1.309

**K**

key indicators 2.24, 2.34  
kif 1.265, 1.267  
  trafficking into Europe 1.272–84  
  see also cannabis resin, Morocco  
*Know Cannabis* test 2.48–51  
Kobert, Rudolf 1.9

**L**

laboratory analysis 1.254–5  
Lapin, Leib 1.9  
last month prevalence 1.51, 1.67–70, 1.144,  
  1.295, 2.68–9  
last year prevalence 1.69, 1.74, 1.144, 2.68–9  
Latvia 1.232–3  
  availability 1.75  
  drug seizures 1.82, 1.83  
  herbal cannabis buying power 1.77  
  legislation 1.80  
  lifetime prevalence 1.67, 1.68, 1.71  
laws see legislation  
law enforcement 1.82–5, 1.147  
  Denmark 1.157–72  
law reform 1.109  
legalisation 1.47  
legislation 1.39–49, 1.63–93  
  consistency of 1.112–13  
  Denmark 1.160–6  
  driving 2.190–1  
  Europe 1.97–117  
  origins of 1.99–102  
licensing 1.126  
Lifeline 1.174  
lifestyle 2.288–9  
lifetime prevalence 1.67–9, 1.73, 2.9, 2.66–7  
lifetime use 2.8  
liposolubility 1.33



## Index

Lithuania 1.232–3  
 availability 1.75  
 drug seizures 1.82, 1.83  
 herbal cannabis buying power 1.77  
 legislation 1.80  
 lifetime prevalence 1.67, 1.68, 1.71, 1.72  
 lobbying 1.39–49  
 locations of use 1.129  
 London 2.209  
 LSD 1.44, 1.74  
 lung damage 2.115–40  
 Luxembourg 1.232–3

## M

Maat in de Shit (Belgium) 2.222  
 McCartney, Paul 1.44–5, 1.48  
 Malta 1.232–3  
 availability 1.75  
 drug seizures 1.82, 1.83, 1.84  
 herbal cannabis buying power 1.77  
 legislation 1.81  
 lifetime prevalence 1.67, 1.68, 1.70  
 manufacture, cannabis resin 1.265–71  
 marihuana see herbal cannabis  
 marijuana see herbal cannabis  
 Marijuana Craving Questionnaire (MCQ) 2.40  
 Marijuana Effect Expectancy Questionnaire (MEEQ) 2.41  
 Marijuana Screening Inventory (MSI-X) 2.41  
 marinol see dronabinol  
 market sizing 1.291–7  
 Martius, Georg 1.7  
 mass media campaigns 2.224–8, 2.230–1  
 Maternal Health Practices and Child Development Study 2.125  
 media coverage 1.51–60  
*Medical Use of Marijuana* 1.20  
 medicinal use 1.3–14, 1.256  
 current situation 1.11–12, 1.17–24  
 decline of 1.10–11  
 mental health 2.157–71, 2.316–17  
 dependence 2.16, 2.33, 2.37, 2.126–7, 2.150  
 depression and anxiety 2.133–4  
 mood 2.119  
 positive benefits 2.165  
 psychological effects 2.115–40  
 meta-analysis 2.205–8  
 metabolism 1.33–4  
 Meurisse, Georges, *Le Haschich* 1.9  
 Million Marijuana March 1.88, 2.101, 2.105  
 MINI screening test 2.39, 2.43, 2.52  
 Misuse of Drugs Act (1971) 1.41, 1.47  
 mobile sale points 1.150

mode of administration 1.175–6  
 adoption of safer methods 1.178–9  
 comparative safety of 1.177–8  
 smoking 1.33, 1.128, 1.175, 1.178  
 snuff 1.128  
 vaporisers 1.177  
 waterpipes 1.177–8  
 monographs see grey literature  
 moral panic 1.51–60  
 Moreau de Tours, Jacques Joseph 1.6  
*Du Haschich et de L'aliénation mentale* 1.6  
 Morocco 1.187–8, 1.190, 1.200–2  
 exporting cannabis 1.263–89  
 prices 1.268  
 production/manufacture 1.265–71  
 seizures 1.273  
 sociopolitical and ecological issues 1.271  
 MS see multiple sclerosis  
 multiple sclerosis 1.17–24  
 mushrooms 1.74  
 music scene 1.78

## N

nabilone 1.20–1  
 naltrexone 2.212  
 National Household Survey on Drug Abuse 2.36–7  
 National Institute on Drug Abuse (USA) 2.253  
 nationalities of traffickers 1.276–8  
 nederwiet 1.151, 1.239, 1.246  
 nefazadone 2.212  
 Netherlands 1.22, 1.23, 1.137–58, 1.232–3  
 cannabis use 1.142–5  
 consumption of cannabis products 1.250  
 decriminalisation 1.145–9  
 Opium Acts 1.140, 1.141  
 potency of cannabis 1.245, 1.248, 1.251  
 Trimbos Institute 1.151, 2.349  
 Netherlands Mental Health Survey and Incidence Study (NEMESIS) 2.131  
 NIDA  
 see also, *Red book* recommendations  
 neurones 1.31  
 neuroscience 1.27  
 neurotransmitters 1.31  
 nomenclature 1.252–3  
 normative beliefs 2.229–31  
 Norway 1.232–3

## O

onset see initiation  
 Ontario alcohol and other drug opinion survey 2.48





- open activism 2.103–5  
  means of 2.105–6
- opium 1.3, 1.10, 1.11, 1.101, 1.190, 1.192, 1.199, 1.284
- Opium Commission (Shanghai) 1.101
- O'Shaughnessy, William 1.5–6  
  *On the Preparations of the Indian Hemp or Gunjah, Cannabis indica* 1.5
- Ottawa Prospective Prenatal Study 2.125
- overdose 2.148
- P**
- patterns of use 1.73
- peers 2.334–6
- perceived availability 1.230–1, 1.232–3, 2.72  
  and cannabis consumption 2.72–4
- perceptions of use 1.77–8
- PERK project 2.225, 2.227
- permit system 1.126
- personal use 1.108–9, 1.111–12, 1.198
- phagocytosis 1.31, 1.36
- pharmaceutical use 1.3–14, 1.17–24
- pharmacodynamics 1.31
- pharmacokinetics 1.31, 1.33–4
- pharmacological effects 1.28, 1.32
- pharmacological treatment 2.212
- pharmacology 1.17–24, 1.27–37, 1.255–6
- pharmacy 1.2–14
- physical effects 1.27–37
- physiological dependence 2.34
- phytocannabinoids 1.32–3
- phytochemicals 1.31
- pipelines 1.294  
  see also seizures
- Plan Nacional Sobre Drogas (Spain) 1.301, 1.307, 1.309
- Poland 1.232–3  
  availability 1.75  
  drug seizures 1.82, 1.83  
  herbal cannabis buying power 1.77  
  legislation 1.81  
  lifetime prevalence 1.67, 1.68, 1.70, 1.72
- political debate 1.87–8
- polydrug prevention 2.219–21
- polydrug use 1.74, 1.119–35, 2.79–95, 2.266–7, 2.290–1  
  risk profiles 2.89–90  
  typography of users 2.88–9
- Pompidou Group 2.230, 2.263, 2.264, 2.350
- popular culture 1.79
- population surveys 1.70–1, 2.29–57
- Portugal 1.232–3  
  consumption of cannabis products 1.250  
  potency of cannabis 1.245, 1.251
- possession laws 1.147
- potency 1.197, 1.219, 1.227–30, 1.239–62  
  cannabis resin 1.228, 1.230  
  changes in 1.244–52  
  comparative 1.232–3  
  definition 1.242  
  herbal cannabis 1.228, 1.229, 1.230  
  increased 2.134  
  proxy measures 1.253
- premature mortality 2.125–6
- prenatal cannabis exposure 2.124–5
- prescription drugs 2.79
- prescription system 1.126
- prevalence 2.3–26  
  comparative figures 2.12–13  
  current 2.11–12  
  Europe 2.19–21  
  and gender 2.18–19  
  increasing use 2.70–1  
  intensive use 2.14–17  
  lifetime 1.67–9, 1.73, 2.2, 2.9, 2.66–7  
  and perceived availability 2.72–4  
  recent 2.9–11, 2.68–9  
  students 2.59–77  
  substance use 2.85–6
- prevention 2.217–44, 2.338–40  
  campaigns 1.85  
  classification systems 2.220  
  consistent approach 2.222  
  education 1.174–5, 2.219–21  
  environmental 2.220, 2.223–4  
  gender focus 2.228  
  heterogeneous settings 2.222–3  
  indicated 2.220, 2.235  
  informal and formalised  
    programmes 2.221–2  
  polydrug 2.219–21  
  school-based 2.247–59  
  selective 2.220, 2.231–5  
  universal 2.220, 2.224–9
- prices 1.76–7, 1.187–212, 1.219, 1.287  
  and availability 1.222–7  
  comparative 1.232–3  
  Europe 1.273–4  
  long-term trends 1.224–7  
  Morocco 1.268
- PRISAM 1.23
- problematic cannabis use 2.329
- problematic use 2.16  
  definition of 2.31
- production  
  cannabis resin 1.199–203, 1.265–71  
  herbal cannabis 1.192–8
- prohibition 1.119–35  
  alternatives to 1.125–6



## Index

protective factors 2.325–45  
protest movements 1.39–49  
    Denmark 1.147–72  
psychoactive properties 1.5, 1.66–7  
psychoactive substances 2.79  
psychological dependence 2.34  
psychological effects 2.127–33  
    dependence 2.34  
    mood 2.119  
psychological risk factors 2.336–7  
psychometric screening 2.29, 2.242  
psychosis see psychological effects  
psychosocial intervention 2.279–95  
psychotic disorders 1.47, 1.54, 1.239, 1.244,  
    2.115–40, 2.326, 2.337  
public debate 1.87–8  
public health impact 2.143–54, 2.157–71  
    social and health harm 2.147–52  
Pusher Street 1.157, 1.159–60, 1.162–3

## Q

quality measures 2.35–6  
Quit the Shit (Germany) 2.222

## R

Rabelais, François 1.5  
RAND Drug Policy Research Center 1.303, 1.309  
rationing 1.126–7  
recent use 2.9–11, 2.68–9  
receptors 1.11–12, 1.19, 1.31, 1.34–6  
reclassification 1.48  
recreational settings 1.53, 1.119, 2.229  
*Red Book* recommendations 2.227  
reefers 1.251–2  
Rees-Mogg, William 1.45  
reference tests 2.35–6  
referrals 1.82, 2.287–8, 2.319–20  
reform movements 1.157–72  
regulatory policies 1.119–35  
    location/circumstances of use 1.129  
    and potency 1.127–8  
relative consumption 1.253  
reproductive system 2.124  
research 2.347–53  
respiratory cancers 2.121–3  
respiratory system 2.120–1  
Richards, Keith 1.44, 1.45  
Rif Mountains see Morocco  
rimonabant 1.22  
risk factors 2.325–45  
    psychological 2.336–7  
risk magnitude 2.163–4  
risk perception 2.74, 2.229–31  
risk profiles 2.89–90  
road safety 2.173–98

roadside testing 2.188–9  
Rotterdam 1.153  
rural areas 1.71

## S

sampling 1.254  
Sativex 1.21–2  
Schedules for Clinical Assessment in  
    Neuropsychiatry (SCAN) 2.36  
schizophrenia 2.132–3  
school-based prevention programmes 2.247–59  
    dissemination of 2.256–7  
    effectiveness of 2.255–6  
    evidence-based 2.250–4  
schools 2.65, 2.79–95, 2.224–8, 2.229–30  
    selective prevention 2.231–2  
Schroff, Carl Damian Ritter von 1.7  
screening 2.29–57  
    concepts 2.32–5  
    validation and quality measures 2.35–6  
screening tests 2.36–8  
    adolescents 2.39–40  
    adults 2.38–9  
    long 2.40–1  
Second League of Nations Opium  
    Conference 1.101  
seizures 1.82, 1.83, 1.195, 1.275, 1.276, 1.294  
    and availability 1.219, 1.220–2  
    cannabis plants 1.221  
    cannabis resin 1.221  
    comparative 1.232–3  
    Europe 1.205, 1.273  
    global 1.204  
    herbal cannabis 1.221–2  
    Morocco 1.273  
    regional breakdown 1.206  
selective prevention 2.220, 2.231–2  
    criminal justice system 2.232–3  
    informal settings 2.233–5  
    school setting 2.231–2  
Severity of Dependence (SDS) Scale 2.36, 2.38,  
    2.46  
sinsemilla 1.191, 1.195–6, 1.198, 1.246  
    potency 1.249, 1.250  
skunk see sinsemilla  
Slovakia 1.232–3  
    availability 1.75  
    drug seizures 1.82, 1.83  
    herbal cannabis buying power 1.77  
    legislation 1.81  
    lifetime prevalence 1.67, 1.68, 1.70, 1.71  
    outpatient treatment services 1.87  
Slovenia 1.232–3  
    availability 1.75  
    drug seizures 1.82, 1.83



- herbal cannabis buying power 1.77
- legislation 1.81
- lifetime prevalence 1.67, 1.68
- smoking 1.33, 1.128, 1.175, 1.178
  - safety of 1.177
- smuggling see trafficking
- snuff 1.128
- social environment 2.334–6
- social harm 2.147–52
- social networks 1.75
- social protest 1.39–49
- social representations 1.77–9
- social responses 1.79–85
- social vulnerability 2.232
- social withdrawal 2.106–7
  - as relationship to society 2.108
- socio-economic factors 1.72
- sociology 1.39–49, 2.97–110, 2.325–45
- sociopolitical context 2.165–6
- Softsecrets 2.224
- Soma 1.39, 1.44
- Soubeiran, Eugene 1.6
- Spain 1.232–3
  - cannabis use 2.20
  - distribution 1.275–6
  - importing cannabis 1.263–89
  - Plan Nacional Sobre Drogas 1.301, 1.307, 1.309
  - prices 1.273–4
  - seizures 1.273
  - trafficking into 1.275–6
- spliffs 1.179
- standardisation 1.287
- stigmatisation 2.108
- street-level availability 1.218
- strength see potency
- students 2.59–77
  - availability 2.64
  - awareness 2.63–4
  - lifetime use 2.66–7
  - recent use 2.68–9
  - supply channels 2.64–5
- subcultures 2.97–110
- sumum 1.239
- supply 1.63–93, 1.187–212, 1.273–4, 1.291–7, 2.64–5
  - and consumption 1.295–6
  - see also availability; market sizing
- supply model 1.293–5
- supply reduction 1.79–85
- surveys 1.70–1
- Sweden 1.232–3
  - Bratt system 1.126
  - cannabis use 1.146
  - drug policy 1.51–60
- Swedish conscript study 2.129

**T**

- Talk to Frank (UK) 2.222
- taxation 1.119–35
  - effectiveness of 1.127
- tetrahydrocannabinol 1.11, 1.19, 1.32
  - chemical structure 1.243
  - decomposition 1.243–4
  - pharmacology 1.33–4
  - and potency 1.227
- tetrahydrocannabinol acid 1.243
- THC see tetrahydrocannabinol
- therapeutic use see medicinal use
- Therapeutic Uses of Cannabis* 1.20
- Tinctura Cannabis indicae* 1.8
- T lymphocytes 1.31
- tobacco 2.79, 2.330–1
  - and cannabis 1.180
  - health effects 2.151
  - prevalence 2.85–6
- tobacco policy 1.123–4
  - alternatives to prohibition 1.125–6
  - consumption after legalisation 1.125
  - cost-effectiveness 1.125
  - and potency 1.128
  - rationing system 1.126–7
- tolerance 2.34
- trade agreements/disputes 1.129
- trafficking 1.203–9, 1.275–6
  - by air 1.280–1
  - by boat 1.282–3
  - by rail 1.282
  - cannabis resin 1.208–9
  - case histories 1.279–83
  - and gender 1.278
  - herbal cannabis 1.206–7
  - large-scale 1.282
  - for multiregional distribution 1.280
  - nationalities of traffickers 1.276–8
  - organisations and networks 1.279
  - see also distribution
- treatment 1.58, 2.203–15
  - adolescents 2.209
  - adults 2.209–12
  - description of 2.284–6
  - pharmacological 2.212
  - service survey 2.279–95
- treatment centres 2.283–4
- treatment clients 2.266–8
- treatment demand 2.261–76
  - data collection 2.264–6
  - Germany 2.305–23
  - incidence of 2.268–74
  - trends in 2.320–1
- treatment referral 2.272–4
- treatment response 1.85–7



## Index

trends in use 2.212.4  
by countries 2.22–4  
Trimbos Institute (Netherlands) 1.151, 2.349  
see also Netherlands  
Turkey, legislation 1.100–1

## U

United Kingdom 1.232–3  
consumption of cannabis products 1.250  
potency of cannabis 1.245, 1.246, 1.249,  
1.250, 1.251  
Talk to Frank programme 2.222  
United Nations Single Convention on Narcotic  
Drugs (1961) 1.102, 1.104  
United States 1.8–9, 1.146  
schools prevention programmes 2.247–59  
universal prevention 2.220, 2.224–8  
best practices 2.227–8  
content 2.225–7  
rationale 2.225  
trends in 2.228–9  
UNODC 1.187–212, 2.144  
Morocco cannabis surveys 1.266  
see also *World Drugs Report*

urban areas 1.71, 1.72  
use see prevalence

## V

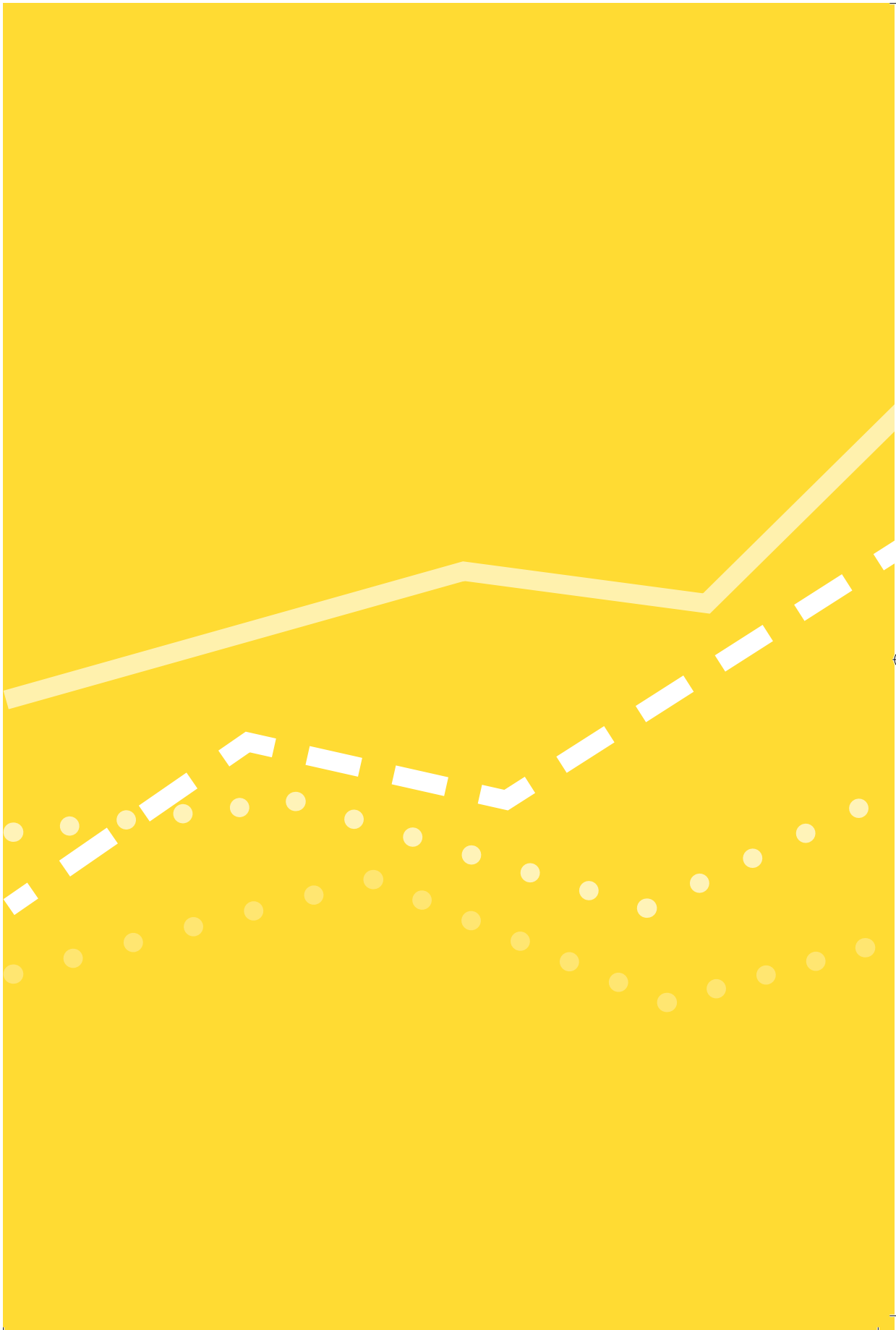
validation 2.35–6  
vaporisers 1.177  
violence 1.283–4  
visual arts 1.78  
von Esenbeck, Friedrich Ludwig Nees 1.5

## W

Warsaw 1.72  
waterpipes 1.177–8  
West Africa 1.187–8, 1.190, 1.200–2  
WHO Expert Committee on Drug  
Dependence 1.105  
Wootton Report 1.39–49, 1.106  
*World Drug Report* 1.193  
see also trafficking, UNODC

## Z

zero tolerance 1.161, 1.162







European Monitoring Centre for Drugs and Drug Addiction

EMCDDA Scientific Monograph Series 8, Volume 2

**A cannabis reader: global issues and local experiences**

Lisbon: European Monitoring Centre for Drugs and Drug  
Addiction

2008 — 392 pp. — 16 x 24 cm

ISBN number: 978-92-9168-312-3

ISSN number: 1606-1691

Catalogue number: TD-32-07-002-EN-C

Price (excluding VAT) in Luxembourg: EUR 20 per volume

© European Monitoring Centre for Drugs and Drug Addiction,  
2008.



