CANNABIS DEPENDENCE AMONG LONG-TERM USERS IN SYDNEY, AUSTRALIA

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EXECUTIVE SUMMARY

Cannabis is the most widely used illicit drug in many Western countries. However, by comparison to tobacco, alcohol and the opiates, little is known about its dependence potential, or the patterns and correlates of symptoms of cannabis dependence. More generally, there has been a lack of research into the characteristics and experiences of long term cannabis users, the group arguably most likely to experience dependence. This study provides detailed information on a sample of long-term cannabis users, recruited and interviewed in Sydney, Australia. It aimed to provide further information on their patterns and experiences of cannabis use, and to compare them to a recently studied population of long-term users in rural NSW. Its particular goal was to study the prevalence and nature of cannabis dependence symptoms among long-term, urban cannabis users, using four different dependence measures.

Two hundred cannabis users, recruited primarily through advertising, were administered a structured questionnaire. Entry to the study required at least weekly use of cannabis for a minimum of five years for males and three years for females. Cross-sectional data were collected on respondents' characteristics and experiences of use and dependence, their health status and other information that may predict behaviour one year later, as assessed at a further interview.

Just over half the sample were male (58%). Respondents had been regularly using cannabis for an average of 11 years. More than half the sample typically used daily (56%), while three quarters (74%) used at least four times a week. The most common route of administration was in a waterpipe or bong, while respondents almost universally smoked the flowering heads of the plant. Cannabis was used in much the same way as people use alcohol, namely, to relax, relieve stress and to feel good. Most (80%) found cannabis easy to obtain, while one in five (19%) currently grew at least some of their own supply. The sample had few cannabis-related criminal convictions, although growing and dealing were common.

Polydrug use was common, with alcohol and tobacco almost universally used on a regular basis. More than half the drinkers in the sample were consuming alcohol at hazardous or harmful levels. Almost half the sample (47%) had experienced problems with drugs other than cannabis, while 20% had sought assistance for these problems. Alcohol and amphetamine had been a problem for one in four respondents (each 27%).

Prevalence of a lifetime DSM-III-R diagnosis of cannabis dependence was 92%, with 40% diagnosed as severely dependent. Three quarters (74%) met an approximation of a lifetime DSM-IV diagnosis. Prevalence of twelve month dependence was 39% on the Severity of Dependence Scale (SDS), 77% on the short UM-CIDI and 72% on a measure of ICD-10 dependence. Only 33% believed they had a problem with cannabis. While most (85%) respondents had moderated their cannabis use at some time, only sixteen people had sought help to do so.

Severity of cannabis dependence was correlated with a number of demographic and drug use variables. Older users were less severely dependent than younger users, and the greater the quantity of cannabis consumed, the greater the dependence score. DSM-III-R dependence was more common among females than males, despite their shorter history of cannabis use.

Problem drinking scores were associated with higher DSM-III-R dependence scores (as measured by the CIDI-SAM and the UM-CIDI). Self-reported problematic cannabis use was generally predicted by a combination of current quantity of cannabis used and a cannabis dependence diagnosis.

While there were many similarities between the Sydney and North Coast samples, there were also differences in patterns and contexts of use, and the prevalence and correlates of cannabis dependence. Sydney users were more likely to be diagnosed as dependent and to believe they had a problem with cannabis. Potential social differences between the samples may partly explain these findings. The Sydney sample may have contained a greater range of respondents that were more representative of residents of a major city, whereas the more tolerant attitudes in a rural area in which cannabis use is widely sanctioned may have encouraged potentially heavier cannabis use.

There was general concordance between severity of dependence scores on DSM-III-R and ICD-10 measures, but not between these and the SDS. The SDS was in greatest agreement with the respondent's self-reported belief they had a cannabis problem. Principal components analyses of the dependence measures provided little evidence for a unidimensional dependence syndrome for ICD-10 and DSM-III-R criteria. There was strong support for unidimensionality of the SDS.

Receiver Operating Characteristic (ROC) analyses on the dependence measures revealed adjusted cut-offs may be necessary for diagnosing dependence in samples of long-term cannabis users. A variety of measurement issues need to considered when comparing different ways of measuring dependence, including the selection of appropriate diagnostic cut-offs and the potential for over-diagnosis. The four instruments examined may have utility in different research and treatment contexts.

Most of this sample recognised potential benefits and harms to health from cannabis use. The main benefits identified were reduced stress and general positive psychological effects. These were offset primarily by perceived negative respiratory and psychological effects. This group had higher unadjusted rates of respiratory long-term conditions and wheezy or whistly chests than the Sydney and Australian comparison groups interviewed in the 1995 National Health Survey. However, given the greater proportion of tobacco smokers among the Sydney sample than the general population, it was impossible to separate the effects of tobacco smoking from those of cannabis smoking in producing respiratory symptoms.

Cannabis dependence and polydrug use were related to psychological well-being. The greater the number of dependence symptoms met and the number of drugs currently used, the greater the psychological distress. Nevertheless, the pattern of well-being scores for the sample as a whole did not indicate a clinical profile of psychological distress warranting intervention among this sample of long-term cannabis users.

CHAPTER 1

INTRODUCTION

Views on the nature of all forms of drug dependence have been heavily influenced by the literature on alcohol dependence. The concept of a drug dependence syndrome was first articulated in the alcohol dependence syndrome (Edwards and Gross, 1976) and subsequently generalised to all psychoactive drugs in both the International Classification of Disease and the American Psychiatric Association Diagnostic and Statistical Manual. Cannabis was one of the drugs identified as having a dependence syndrome, despite early views that cannabis was not a drug of dependence. One of the major aims of the current study was to evaluate the evidence for the inclusion of cannabis within the class of drugs that can produce a dependence syndrome.

Cannabis is the most widely used illicit drug in many Western countries, with one third of Australians over age 14 having tried the drug (Donnelly and Hall, 1994; National Drug Strategy, 1996). However, in comparison with tobacco, alcohol and the opiates, little is known about its dependence potential, or the patterns and correlates of symptoms of cannabis dependence. This absence of evidence is noteworthy given reports in Australia and overseas of cannabis users seeking assistance to cease or modify their use. More generally, there has been a lack of research into the characteristics and experiences of long term cannabis users, the group arguably most likely to experience dependence.

There is one Australian study which has examined the characteristics of long-term users, including their experiences of dependence, that was conducted in rural NSW (Didcott et al, 1997). This study provides detailed information with which to compare the findings of the current report of long-term cannabis users, recruited and interviewed in Sydney, Australia. The current study aimed to provide further information on the patterns and experiences of cannabis use among a different sample of urban cannabis users. Its particular goal was to study the prevalence and nature of cannabis dependence symptoms among long term urban cannabis users. Four dependence measures were incorporated in order to assess the utility of a variety of different measures of dependence symptoms.

This chapter aims to give a background to the issues discussed in the body of the report. Firstly, an outline of the concept of drug dependence is provided. This is followed by the evidence for a cannabis dependence syndrome, namely, evidence from surveys of prevalence in the general population, and studies of long-term cannabis users and clinical populations. A brief review of the animal and human literature on the experimental evidence for dependence, and the likely distribution of risk for developing dependence, follows. Finally, the chapter concludes with an outline of the aims of the study.

1.1 The Drug Dependence Syndrome

For much of the 1960s and 1970s the apparent absence of tolerance, and of a withdrawal syndrome analogous to that seen in alcohol and opioid dependence, supported the consensus that cannabis was not a drug of dependence. Expert views on the nature of dependence changed during the late 1970s and early 1980s, when the more liberal definition of drug dependence embodied in Edwards and Gross's (1976) alcohol dependence syndrome was extended to all psychoactive drugs (Edwards et al, 1984). The drug dependence syndrome reduced the emphasis previously placed upon tolerance and withdrawal as defining features of dependence. It attached greater importance to symptoms of a compulsion to use, a narrowing of the drug using repertoire, rapid reinstatement of dependence after abstinence, and the high salience of drug use in the user's life. Symptoms of "physical dependence" were considered within the broader cognitive-behavioural context, and seen as neither necessary nor sufficient for a diagnosis of dependence. Thus, the dependence syndrome was "... manifested by a behavioural pattern in which the use of a given psychoactive drug, or class of drugs, is given a much higher priority than other behaviours that once had higher value. The term syndrome is taken to mean no more than a clustering of phenomena so that not all the components need always be present, or not always present in the same intensity" (Edwards, Arif and Hodgson, 1984, pp.79-80).

Table 1: DSM-III-R dependence criteria

1	the substance is often taken in larger amounts or over a longer period than the person intended
2	there is a persistent desire or one or more unsuccessful efforts to cut down or control substance use
3	a great deal of time is spent in activities necessary to get the substance (e.g., theft), taking the substance, or recovering from its effects
4	frequent intoxication or withdrawal symptoms when expected to fulfil major role obligations at work, school, or home, or when substance use is physically hazardous
5	important social, occupational, or recreational activities given up or reduced because of substance use
6	continued substance use despite knowledge of having a persistent or recurrent social, psychological, or physical problem that is caused or exacerbated by the use of the substance
7	marked tolerance
8*	characteristic withdrawal symptoms
9*	substance often taken to relieve or avoid withdrawal symptoms

Source: American Psychiatric Association, 1987, pp. 167–8.
* Criteria 8 and 9 not required for cannabis, hallucinogen and PCP dependence to be diagnosed.

There were a number of novel features of the concept of a drug dependence syndrome. First, the drug dependence syndrome was not necessarily assumed to be a major disability since it may cause little physical damage or social impairment. A diagnosis of drug dependence was therefore differentiated from a diagnosis of drug abuse which was seen as reflecting the consequences of use. Second, the degree of dependence experienced could vary along a continuum from low to high severity. Third, the syndrome was assumed to be unidimensional. Although multidimensional forces such as biology and learning may act to produce dependence within an individual, the essential nature of the syndrome was that it represented a single factor.

This new conception of dependence was most directly reflected in the World Health Organization (WHO) International Classification of Diseases (ICD) codes, the most recent of which is the ICD-10 (WHO, 1992). This classification has six criteria which explicitly operationalise the dependence syndrome. A dependence diagnosis is met if at least three of six criteria have been met. It has also influenced the development of the Third Revised Edition of the Diagnostic and Statistical Manual of the American Psychiatric Association (1987) (DSM-III-R), which reduced the importance of tolerance and withdrawal symptoms in favour of a greater emphasis upon continued use of a drug in the face of its adverse effects.

A diagnosis of psychoactive substance dependence is made if any *three* of the nine criteria listed in Table 1 have been present for one month or longer.

The DSM-III-R has recently been superseded by DSM-IV(American Psychiatric Association, 1994). This has modified the number and pattern of criteria that are required for a person to receive a diagnosis of dependence. DSM-IV has only seven instead of nine criteria, following the removal of Criterion 4 (frequent intoxication) and the collapsing of withdrawal and withdrawal relief (Criteria 8 and 9) into one criterion. Further, a lifetime diagnosis requires that at least three criteria are met within any 12 month period; it no longer specifies the duration of symptom occurrence as in DSM-III-R. Finally, DSM-IV dependence is subtyped by the presence or absence of tolerance and withdrawal phenomena. Further, there are other differences between the ICD and DSM classification systems (e.g., see Rounsaville et al, 1993).

The DSM criteria may seem to conflict with community conceptions of drug dependence in that they explicitly include tobacco smoking as a form of drug dependence and could conceivably include caffeine dependence (among heavy coffee drinkers) (see Hughes et al, 1992). The fact that these forms of drug taking are not usually regarded as producing drug dependence is less a reason for rejecting these diagnostic criteria than a signal of the need to persuade the community to adopt a broader conception of drug dependence, which reduces the emphasis upon "physical" dependence as evidenced by the occurrence of a marked withdrawal syndrome on abstinence.

1.2 The Prevalence of Cannabis Dependence

There has not been an organised program of research on the cannabis dependence syndrome comparable to that undertaken on the alcohol and the opiate dependence syndromes. Instead, its existence and characteristics have been inferred from a diverse body of research studies.

1.2.1 Epidemiological Evidence

1.2.1.1 The Epidemiological Catchment Area (ECA) Study

The first epidemiological evidence on the prevalence of cannabis abuse and dependence in the community came from the Epidemiological Catchment Area (ECA) study (Robins and Regier, 1991) which involved face-to-face interviews with 20,000 Americans in 5 catchment areas. A standardised and validated clinical interview schedule was used to elicit a history of psychiatric symptoms found in 40 major psychiatric diagnoses, including DSM-III diagnoses of drug abuse and dependence (Anthony and Helzer, 1991). Although not a true random sample of the American population it still provides valuable data on the prevalence of different types of drug dependence and their correlates in a non-treatment population.

Cannabis was the most commonly used illicit drug in the ECA study, having been used by 76% of those who had used any illicit drug more than five times. Cannabis abuse and/or dependence was also the most common form of abuse and/or dependence on an illicit substance, with 4.4% of the population being so diagnosed compared with 1.7% for stimulants, 1.2% for sedatives, and 0.7% for opioid drugs. When DSM-III-R diagnoses of dependence and abuse were approximated, three fifths of those with a DSM-III diagnosis of dependence and/or abuse met the criteria for dependence.

The proportion of current users who were dependent increased with age, from 57% in the 18 to 29 year age group to 82% in the 45 to 64 year age group, reflecting the remission of less severe drug abuse problems with age. Only a minority of those who had a diagnosis of abuse and/or dependence (20% of men and 28% of women) had mentioned their drug problem to a health professional, even though 60% to 70% had sought medical treatment in the previous month.

1.2.1.2 ECA Replications

Similar estimates of the population prevalence of cannabis dependence were produced by a community survey of psychiatric disorder among 1498 adults in Christchurch, New Zealand in 1986, using the same sampling strategy and diagnostic interview as the ECA study (Wells et al, 1992). The prevalence of having used cannabis on five or more occasions was 15.5%, remarkably close to that of the ECA estimate, as was the proportion who met DSM-III criteria for marijuana abuse or dependence, namely, 4.7%. The fact that this survey largely replicated the ECA findings for most other diagnoses, including alcohol abuse and dependence, enhances confidence in the validity of the ECA study findings.

1.2.1.3 The National Comorbidity Survey (NCS)

More recently, the US National Comorbidity Survey (NCS) (Anthony, Warner and Kessler, 1994) collected national data on the prevalence and correlates of psychiatric morbidity and comorbidity. The study aimed to improve on the methodology of the ECA study by making the samples nationally representative, and minimising non-response. Thus, the survey used

a stratified, multi-stage area probability sample of non-institutionalised people aged 15 to 54 from 48 coterminous states, supplemented by a representative sample of students housed on campus. A total of 8098 people were interviewed (an 82% response rate).

The NCS collected information on reported lifetime and 12-month prevalence of alcohol and other drug use and dependence. Lifetime use was defined as having tried a drug at least once, and DSM-III-R dependence was measured among those who reported lifetime use (or had consumed at least 12 drinks in one year). This is more inclusive than the ECA definition of a "user", which required use of a drug at least five times. A lifetime diagnosis of dependence was made if a respondent met 3 or more of 9 criteria in their life, while a twelve month diagnosis was made if 3 or more symptoms had been met in the year prior to interview among those with a lifetime diagnosis.

Just on half (51%) of the sample had used an illegal drug or non-medically used a prescription drug in their lifetime. The most common of these was cannabis (46%), with at least one in ten having tried cocaine (17%), other stimulants (15%), anxiolytics (13%), psychedelics (11%) and analgesics (10%). Nearly one in ten (7.5%) of the sample had a lifetime history of psychoactive substance dependence. The most frequent dependence diagnoses were tobacco (24%) and alcohol dependence (14%). A lifetime diagnosis of cannabis dependence was the third most common diagnosis, with 4% of the sample meeting criteria. This estimate is very similar to the ECA estimate of lifetime cannabis dependence, and is not surprising given the greater prevalence of cannabis use than of the other illicit substances. The prevalence of cannabis dependence placed the frequency of its occurrence between panic disorder and generalised anxiety disorder in the general population. Cannabis dependence was followed by cocaine (3%) and stimulant (2%) dependence diagnoses.

A different picture emerged when the risk of dependence was expressed as a proportion of those who had been exposed to each psychoactive drug. Among those who had used cannabis more than once, 9% met lifetime criteria for cannabis dependence. This placed it behind most other psychoactive drugs in terms of dependence-potential, with tobacco first (with 32% of users meeting criteria for dependence), followed by heroin (23%), cocaine (17%), alcohol (15%) and other stimulants (11%). Cannabis and anxiolytics users were equally likely to meet lifetime dependence criteria (both 9%). Thus, among persons who had used a psychoactive drug once, cannabis was one of the least likely to produce dependence.

Men were more likely than women to be cannabis-dependent: 6% of all males and 12% of male users were dependent compared to 2% of all females and 6% of female users. There were also age-related differences in dependence, with a lower prevalence of use, and dependence among users, as they aged. Thus, while 15% of 15-24 year old users were dependent, this was the case for only 3% of users aged 45 or older.

1.2.1.4 Other Population Studies

A recent Canadian telephone survey of 2022 adults (aged at least 18 years) in Ontario used an operationalisation of ICD-10 criteria to estimate the prevalence of alcohol and other drug dependence (Adlaf, Ivis and Smart, 1994). The study used a two-stage probability sampling method incorporating random-digit-dialling techniques, and a 63% response rate was achieved. Dependence was assessed with a nine item questionnaire, which addressed the six ICD-10 criteria. These criteria were: a strong desire to use; difficulties in controlling use;

physiological withdrawal or use to relieve withdrawal; tolerance; progressive neglect of other activities in favour of drug use; and persistent use despite adverse physical or mental effects. A person was considered to be dependent on a drug if they met at least three of six dependence criteria during the 12 months prior to interview.

Cannabis was the most frequently used illicit drug, followed by cocaine (6% in lifetime and 1% in last year). Cannabis dependence criteria were met by 1.2% of the sample, compared to 5.3% who were diagnosed as alcohol dependent. Among those who had used cannabis at least once in their lifetime, 13.3% were classified as cannabis dependent. The most common form of drug dependence among those who had ever used a drug once was tranquilliser dependence, with 15.8% of users meeting criteria. Unfortunately there was no examination of the demographic correlates of cannabis dependence.

Kandel and colleagues (1997) recently reported on a proxy measure of cannabis dependence among recent cannabis users interviewed in three aggregated waves of the US National Household Surveys on Drug Abuse (1991 to 1993). With a nationally representative sample of 87 915 people aged at least 12 years, an approximation to a DSM-IV diagnosis was made for those who had used cannabis in the last year. This was based on information collected on dependence symptoms, frequency and quantity of use and experience of cannabis-related problems. An individual was defined as dependent in the last year if they met at least three out of seven of these indicators of DSM-IV dependence during this time. Nine percent of the sample had used cannabis in the last year, with use significantly more likely among men and younger people. According to these criteria, 8.2% of last year users were dependent on cannabis (compared to 5% for alcohol, 12% for cocaine and 28% for nicotine). Multivariate analyses showed males were significantly more likely than females to have a cannabis dependence diagnosis, while significantly higher rates of dependence occurred among adolescents compared to other age groups. These findings were complicated by an interaction between gender and age, whereby adult males and adolescent females were more likely to be dependent than adult females.

1.2.2 Studies of Long-Term Cannabis Users

There have been a few studies of long-term users in naturalistic settings which have produced suggestive evidence of cannabis dependence. However, it is worth noting that these were mostly conducted a decade or more ago in the US (Hendin et al., 1987; Kandel and Davies, 1982; Rainone et al., 1987; Weller et al., 1984), Costa Rica (Carter et al., 1980; Page et al., 1988), Jamaica (Rubin and Comitas, 1975) and Greece (Stefanis et al., 1977), and it is not clear how applicable they are to the characteristics and experiences of Australian cannabis users.

Weller, Halikas and Morse (1984) followed a cohort of 100 regular marijuana users who were first identified in 1970-1971 and assessed them for alcohol and marijuana abuse using Feighner's criteria for alcoholism and an analogous set of criteria for marijuana (see Weller and Halikas, 1980). Their concept of abuse would arguably have included most cases of dependence. They were able to interview 97 of their subjects about the amount and frequency of alcohol and marijuana use, and their experience of problems related to the use of both drugs. According to Feighner's criteria, 9% of subjects were alcoholic and 9% were "abusers" of marijuana, with 2% qualifying for both diagnoses. The most common symptoms reported among those classified as marijuana abusers were: feeling "addicted", a history of failed

attempts to limit use, early morning use, and traffic arrests related to marijuana use.
Hendin and colleagues (1987) reported on the experiences of 150 long-term daily cannabis users who had been recruited through newspaper advertisements. Although they did not explicitly inquire about the symptoms of a cannabis dependence syndrome, substantial proportions of their sample reported experiencing various adverse effects of long-term use, despite which they continued to use cannabis. These included: impaired memory (67%), an impaired ability to concentrate on complex tasks (49%), difficulty getting things done (48%), or thinking clearly (43%), reduced energy (43%), ill health (36%), and accidents (23%). Substantial minorities reported that it had impeded their educational (31%), and career achievements (28%), and half of the sample reported that they would like to cut down or stop their use.

These findings have been broadly supported by Kandel and Davies (1992). Kandel and Davies reported on the characteristic problems reported by near daily cannabis users (aged 28-29 years) who were identified in a prospective study of the consequences of adolescent drug use. The major adverse consequences of use were: subjectively experienced cognitive deficits, reduced energy, depression, and problems with spouse.

1.2.2.1 The North Coast Cannabis Study
The first Australian study of patterns and correlates of cannabis use among long-term users of the drug was recently published (Didcott et al, 1997). The NSW North Coast was chosen for this study because it was widely reputed to be a region where there was a concentration of long-term cannabis users, the users most likely to experience dependence. The communities of Nimbin, Mullumbimby, Byron Bay and Bellingen have been centres of cannabis use since the early 1970s. The size and frequency of cannabis seizures in the North Coast have been consistently high and rates of offences for cannabis use and cultivation are considerably higher on the North Coast than in the rest of NSW (NSW Bureau of Crime Statistics and Research, 1996). The study involved in-depth interviews with 268 long-term cannabis users recruited through "snowball" sampling methods. The main criteria for inclusion in the sample was at least 10 years of weekly, or more frequent, cannabis use. The sample had been using cannabis regularly for 19 years, and 60% used daily.

One in four of the sample believed that their cannabis use was a problem. However, just over half (57%) met criteria for cannabis dependence according to approximations of DSM-III-R and ICD-10 criteria. According to the Severity of Dependence Scale score only 15% were classified as dependent. There was strong agreement between the ICD-10 and DSM-III-R criteria for dependence and a large correlation between the number of each set of criteria that were met. There was only modest agreement between these two measures and the SDS.

The quantity of cannabis typically used was related to dependence as assessed by the ICD-10 and DSM-III-R criteria, but not the SDS. The earlier a person had first used cannabis the more dependence criteria they met. The number of types of illicit drugs that a person had used was correlated with the number of cannabis dependence symptoms on the ICD-10 and DSM-III-R, but not with SDS score. All three measures of dependence were strongly related to the respondent believing that they had a problem with their cannabis use.

This study confirmed that there is a subculture on the north coast of NSW in which

cannabis use is an integral part of everyday life and social relationships. Cultivation of cannabis for personal use was common and for a minority it was a source of income. The typical long-term user was a male or female, aged in their mid-thirties to early forties, who was living in a rural setting, and who was better educated, and more likely to be self-employed or working part-time than their age peers.

Over half of the sample met ICD-10 and DSM-III-R criteria for cannabis dependence. Those who regarded their cannabis use as a problem met more of these criteria than those who did not, but most of those who met dependence criteria did not believe they had a problem with cannabis.

1.2.3 Clinical Populations

Evidence from clinical populations comes from two major sources: studies of people who present to treatment services for cannabis-related problems, and a variety of statistical databases or indicators of people presenting to alcohol and other drug treatment agencies.

1.2.3.1 USA

During the 1980s evidence began to emerge that there had been an increase in the number of persons seeking help with cannabis as their major drug problem (e.g., Jones, 1984). Many of these patients behaved "as if they were addicted to cannabis" and they presented "some of the same problems as do compulsive users of other drugs" (p 711). Roffman and Barnhart (1988) reported a strong response to a series of community advertisements offering help to people who wanted to stop using marijuana. In a two week period they received 225 calls, the majority from long term cannabis users who reported a variety of marijuana-related problems. These included concerns related to memory, self-esteem, health, family relationships and financial matters.

In a trial comparing the efficacy of two types of marijuana-specific treatment programs (Stephens et al., 1993; 1994), 392 people responded to media advertisements and were assessed for entry onto the program in a period of three months. Clients were assessed using the Drug Abuse Screening Test (DAST), with scores indicating clinical levels of abuse in this sample (88% exceeded a cut off of 5). The most frequently reported adverse consequences of cannabis use in the 90 days before assessment were inability to stop using (93%), feeling bad about abusing cannabis (87%), procrastinating (86%), loss of self-confidence (76%), memory loss (67%) and withdrawal symptoms (51%). In the absence of control groups, however, it is impossible to be certain that the prevalence of these symptoms is higher than in the general community, and that they were not present prior to cannabis use, as has been reported in some longitudinal studies (e.g. Shedler and Block, 1990).

There are other indicators of cannabis-related problems in the US. These include the regular Pulse Check series of Office of National Drug Control Policy, which includes quarterly estimates of treatment presentations in 10 treatment agencies in each of four regions of the US. From 1994 to 1996 cannabis appeared to be the primary drug of abuse for between 11% and 26% of clients, with many regional variations evident. In general, US cannabis treatment presentations are male, polydrug (particularly alcohol) users, and mostly over age 20 years (United States Office of National Drug Control Policy, 1994; 1996).

1.2.3.2 Europe

Sweden, which has had a long history of hashish use, has also experienced an increase in the number of heavy hashish users presenting to treatment services for assistance with problems caused by its use (Engstrom et al., 1985). Tunving and colleagues (1988) have described their experience treating approximately 100 individuals per year who presented to Swedish treatment services requesting help in controlling their cannabis use. Although no data were reported on the proportion of these individuals who satisfied the DSM-III-R criteria for cannabis dependence, their patients typically complained of symptoms which arguably would meet some of its criteria.

It is estimated that 3.5% of hashish smokers in the Netherlands (24000 people) have problems with the drug (Kerssemakers, 1996). Treatment programs in Amsterdam have been attracting cannabis users since 1974, although a rapid rise in help-seeking was noted in the 1980s up until the present. The Jellinek Centre in Amsterdam was attracting three to four cannabis-smoking clients a week in late 1996 (Kerssemakers, 1996), while a minimal intervention aimed at developing self-control strategies has been established for heavy smokers aged 15 to 25 years (Dupont and Niewijk, 1996).

The 1995 Annual Report on drug problems in the European Union (EU) (European Monitoring Centre for Drugs and Drug Addiction, 1996) presents limited information on the extent of cannabis use and related problems. Since 1990, nine out of the 15 EU Member States have conducted national surveys of illegal drug use. Differing methodologies, reporting systems and historical trends make national comparisons difficult. In terms of treatment clients, those seeking help for heroin use are most numerous in nearly all countries, representing between 70-95% of all clients. Cannabis users represent between 4% and 20% of clients attending treatment agencies in the EU, figures comparable to those presenting for problems with cocaine and amphetamine (although this is a particular problem in certain countries). In the UK, where data is limited, cannabis users represented 7% of treatment clients, compared to 70% with opiate problems, 3% cocaine, 9% amphetamine and 1% hallucinogens.

1.2.3.3 Australia

In Australia there were early difficulties in establishing the number of clients presenting to treatment agencies with cannabis problems due to inconsistencies in the ways of coding treatment presentations and the general lack of databases addressing this issue (Tebbutt, Muir and Heather, 1991). In 1989, cannabis was the primary drug problem of 1.8% of males and 0.1% of females presenting to NSW treatment services (Tebbutt, Muir and Heather, 1991). More recently there are indications that some heavy cannabis users request help in controlling their use. Didcott and colleagues (1988), for example, reported on the characteristics of 3,462 clients seen in 12 residential treatment services in New South Wales in 1985 and 1986. They found that cannabis was identified as the "primary drug problem" by 25% of clients seen, second only to the opioid drugs which were so identified by 73% of clients. Just over half of all clients (52%), the majority of whom were polydrug users, identified their cannabis use as "a problem".

The prevalence of cannabis use as a principal drug problem was lower in a 1992 National Census of Clients of Australian Treatment Service Agencies (Chen, Mattick and Baillie, 1993). In this census cannabis use was the *main* drug problem for 6% of the 5,259 clients, fifth in order of importance behind alcohol (52%), opiates (26%), tobacco (9%) and

opiate/polydrug problems (7%). This prevalence increased to almost 7% in the 1995 Census (Torres et al, 1995).

1.2.4 Experimental Evidence

Although tolerance and withdrawal symptoms are not required within DSM-III-R or DSM-IV, there is evidence that both can occur under certain conditions of dosing with cannabinoids. This should not be surprising since, as Hollister (1986) has observed, cannabis "would have been an exceptional centrally acting drug if tolerance/dependence were not one of its properties" (p 9).

Much of the research on this topic was conducted in the 1970s and 1980s. Recent developments in the pharmacology of cannabis have included the discovery of a cannabis receptor (see Adams and Martin, 1996) and a selective cannabinoid antagonist (Rinaldi-Carmona et al, 1994). Such discoveries will hopefully encourage research which can further illustrate the nature and mechanisms of withdrawal and tolerance phenomena.

1.2.4.1 Tolerance

Since the mid-1970s evidence has emerged from human and animal studies that chronic administration of high doses of THC results in the development of marked tolerance to a wide variety of cannabinoid effects, such as cardiovascular effects, and to a subjective "high" in humans (Compton, Dewey, and Martin, 1990; Fehr and Kalant, 1983; Hollister, 1986; Jones, Benowitz and Herning, 1981; National Academy of Science, 1982).

Jones and Benowitz (1976) provided convincing evidence in humans of the development of tolerance to the cardiovascular and subjective effects of THC. They conducted human laboratory studies of the effects of high doses of THC (210 mg per day) administered orally over a period of 30 days on a fixed dosing schedule, to healthy male volunteers who had an extensive history of cannabis use. Clinical observations of the subjects showed that as the duration of the high dose regimen increased there was a decline in the positive effects of intoxication, and in the subjects' ratings of the "high". There was a marked deterioration in the subjects' social functioning according to nurses' ratings during the early days of the high dose regimen, but there was almost complete recovery to baseline levels by the end of the dosing period. There was similar evidence of recovery in cognitive and psychomotor performance in the course of the high dose regimen.
Similar observations of tolerance to the subjective effects of cannabis have been made by Georgotas and Zeidenberg (1979).

1.2.4.2 Withdrawal

Evidence for a cannabis withdrawal syndrome comes from laboratory studies of animals, and laboratory and observational studies of humans. The majority of animal studies on withdrawal were conducted prior to the recent discovery of a cannabinoid antagonist (Rinaldi-Carmona et al, 1994), and have produced conflicting results. Most attempted to precipitate a withdrawal syndrome by abruptly withdrawing the drug from animals who had been chronically maintained on it. A second technique was to precipitate withdrawal by administering opioid antagonists such as naloxone (Adams and Martin, 1996).

A number of these studies have produced evidence for an abstinence syndrome. For example, Jones and Benowitz (1976) maintained monkeys on a schedule of chronic high

doses of THC. Upon cessation symptoms consisted of: "yawning, anorexia, piloerection, irritability, tremors and photophobia" (p. x). Similar symptoms were also observed in their human subjects who were abruptly withdrawn from high doses of THC. Within six hours of withdrawal subjects complained of "inner unrest", and by 12 hours "increased activity, irritability, insomnia, and restlessness were reported by the subjects and obvious to staff" (p 632). Common symptoms reported were " `hot flashes', sweating, rhinorrhea, loose stools, hiccups and anorexia" (p 632) which many subjects compared to a bout of influenza. These symptoms were reduced by the resumption of marijuana use (Jones et al, 1981).

Georgotas and Zeidenberg (1979) reported similar withdrawal phenomena in their long-term dosing study. During the first week of a four week wash out period after four weeks of receiving 210 mg of cannabis a day the subjects "became very irritable, uncooperative, resistant, and at times hostile ... their desire for food decreased dramatically and they had serious sleeping difficulties" (p430). These effects disappeared during the final three weeks of the wash out. These studies suggest that tolerance can develop to cannabis's effects and that a withdrawal syndrome can occur on abstinence under certain conditions, namely, chronic administration of doses as low as 10 mg per day for 10 days (Jones et al, 1981).

The results of these earlier laboratory studies have received suggestive support from a small number of studies of heavy cannabis users. Weller and Halikas (1982), for example, found that the self-reported positive effects of cannabis use diminished over a five to six year period in regular users of cannabis. The average reduction in the frequency of experiencing the positive effects was small, perhaps because only 27% were daily users, but they were consistent and included some of the symptoms reported in laboratory studies.

Finally, recent research with the antagonist SR 141716A has consolidated the evidence that cannabis can produce physical dependence. Studies on antagonist administration in rats have produced marked changes in animals maintained on THC. The most recent study (de Fonseca et al, 1997) induced withdrawal after administering the antagonist to rats maintained for a fortnight on daily doses of a synthetic cannabinoid. The behavioural features of the syndrome were similar to those previously reported. Research has yet to be reported using the antagonist in humans. It has been suggested that the symptoms evidenced in animals may be much more dramatic than that displayed by humans - while the antagonist compresses and accentuates the withdrawal process, the process may be milder and more drawn out under the more naturalistic conditions of human use (Swan, 1995).

1.3 The Risk of Dependence

It is important to put the existence of a cannabis dependence syndrome into perspective to avoid a falsely alarmist impression that all cannabis users run a high risk of becoming dependent upon cannabis. A variety of estimates suggest that the crude risk is small and probably more like that for alcohol rather than nicotine or the opioids. Other data suggests that certain characteristics of users increase the risk of dependence developing, although in most cases it is impossible to place quantitative estimates on the latter risks.

As with all drugs of dependence, persons who use cannabis on a daily basis over periods of weeks to months are at greatest risk of becoming dependent upon it. The risk of developing dependence among less frequent users of cannabis, including experimental and occasional

users, would be substantially less than that for daily users. A number of reasonably consistent estimates of the risks of a broader spectrum of users becoming dependent on cannabis can be obtained from a number of studies (for a detailed discussion of issues relating to the calculation of this risk see Hall, Solowij and Lemon, 1994; Hall, 1996).

These estimates suggest the following rules of thumb about the risks of cannabis dependence. For those who have ever used cannabis the risk of developing dependence is probably of the order of one chance in ten. The risk of dependence rises with the frequency of cannabis use, as it does with all drugs, so that among those who use the drug more than a few times the risk of developing dependence is in the range of from one in five to one in three. The range of the estimates reflects variations in the number of occasions of use that is taken to reflect more than simple experimentation, with the general rule being that the more often the drug has been used, and the longer the period of use, the higher the risk of becoming dependent. Although there have been few formal comparisons of the dependence potential of cannabis with that of other drugs, these risks are probably more like those associated with alcohol than those associated with tobacco and opiates (Woody, Cottler and Cacciola, 1993).

Risk may not be equally distributed across the population of users. There is some evidence from epidemiological research that males and younger users are at a greater risk of developing dependence than their female and older counterparts (Anthony and Helzer, 1991; Anthony et al, 1994; Kandel et al, 1997). However, these findings need to be replicated in a variety of samples of cannabis users.

1.4 Aims of the Study

As the preceding review has indicated, there is limited research on the dependence potential of cannabis. In particular, there is little known about long-term cannabis users and their experiences of dependence. Given the widespread use of cannabis, the clinical features of cannabis dependence deserve to be better delineated and studied. This would enable its prevalence to be better estimated, and individuals with this dependence to better recognised and treated. An enhanced knowledge of dependence is important because it influences the ways in which problematic and non-problematic use are defined and understood, and shapes the delivery of assessment and treatment interventions. Although cannabis dependence is likely to be a larger problem than previously thought, we should be wary of over-estimating its social and public health importance. It will be most common in the minority of heavy chronic cannabis users, the population examined in this research.

This study should assist a better understanding of the consequences of long-term use by providing valuable baseline data on patterns and correlates of cannabis use and dependence in an understudied population. It will also allow an examination of the influence of the context within which cannabis is used on the manifestations of dependence. This will involve a comparison of the characteristics of this urban sample of long term cannabis users with a unique rural sample studied by Didcott and colleagues. Further, it will also assist to place the consequences of cannabis dependence in a public health context, and provide information on issues relevant to service delivery. Finally, an examination of different methods of measuring dependence will illuminate methodological issues which may be relevant to the utility of different ways of assessing cannabis dependence in a variety of settings.

The main aims of the study were:

(i) to provide data on the characteristics and beliefs of long-term users in an urban environment, compared to those living in a rural area;

(ii) to examine the prevalence and correlates of cannabis dependence among this group, and experiences of problematic use; and

(iii) to explore the validity of a dependence diagnosis, by examining the structure of the dependence syndrome, and the similarities and differences among four different measures of dependence.

CHAPTER 2

METHODS

2.1 Design

This report describes the findings of an initial interview of a sample of 200 long-term cannabis users in Sydney, who were to be followed up for one year. It used a structured questionnaire to gather cross-sectional data on respondents' characteristics and experiences, as well as other information that may predict behaviour one year later, as assessed at a further interview.

As there is no definitive information on the number of regular cannabis users in Australia, or the composition or characteristics of the cannabis using population, no attempt was made to gather a random sample of regular users. Sampling is a common problem when researching illicit drug use, where the behaviour is illegal and the population may be unwilling to voluntarily offer information on their drug use in household surveys. Given the paucity of research on this group, it was decided to interview a convenience sample of regular cannabis users, while trying to include sufficient numbers of men and women to enable gender comparisons to be made, and to include users from a number of different regions of Sydney.

2.2 Sampling and Entry Criteria

Two hundred (200) respondents were recruited, primarily from advertisements placed in a number of Sydney newspapers and magazines. Initially, ads were placed in *Drum Media*, a widely distributed weekly entertainment magazine and *Sydney Review*, a weekly arts and entertainment magazine. As few people from the southern or western suburbs were responding to these ads, extra ads were placed in weekly local newspapers: the *St George Leader*, which covers Sydney's southern suburbs, and the *Liverpool* and *Fairfield Champions*, which cover Sydney's south-western and western suburbs. While the majority of respondents were recruited via advertising (71%) or snowball sampling arising from advertising (12%), a small proportion of respondents were acquaintances (4%), or friends of acquaintances (9%), and 5% heard of the study through other means, for example, by participating in other research projects at NDARC.

The major criterion for inclusion in the study was "regular cannabis use". In the absence of any recognised definition of "regular", it was decided to adapt the definition used in the

North Coast cannabis study. Given the entrenched cannabis culture on the North Coast, it was decided that their criterion of 10 years of at least twice weekly use was too strict for a Sydney sample, which it was surmised would be more like the "average" cannabis smoking population. Inclusion in the study accordingly required at least five years of weekly cannabis use for men, and at least three years of weekly use for women. A lower threshold of regular use was allowed for women, since fewer women than men are regular cannabis users and it was feared that setting too high a criterion for entry would lead to too few women being included.

Initially, the intention was to exclude persons who had a history of more than monthly use of drugs other than alcohol and tobacco. It soon became clear , however, that cannabis was often used with other drugs, so this criterion was relaxed and anyone who met the criterion of at least weekly cannabis use for the minimum number of years was included in the sample.

2.3 The Interview

The interview consisted of a structured questionnaire based on one used by Didcott and colleagues (1997), and was administered by the first author. The majority of the questionnaire was administered by the interviewer, although four short, standardised questionnaire components were self-completed. Questions were predominantly quantitative, although a number of exploratory, open-ended questions were included to examine the respondents' experiences and perceptions about their use.

The areas addressed by the interview were:

Demographic characteristics: Information was collected on age, gender, country of birth, area of residence, education, employment, and living situation.

Drug use history: Respondents were questioned on ever use and regular (at least monthly) use of heroin/opiates, other analgesics, alcohol, amphetamine, cocaine, benzodiazepines, barbiturates, hallucinogens, inhalants and nicotine. Respondents were also asked if they had ever regularly used these drugs with cannabis, about problematic use and treatment seeking for other drugs and whether they had a familial history of AOD problems.

Current Drug Use: Drug use in the last month was assessed using the drug use section of the Opiate Treatment Index (OTI) (Darke et al., 1992). Problematic alcohol use was assessed in those who had consumed alcohol in the last year using the self-administered Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al, 1993a). This instrument has been shown to perform well in detecting alcohol use disorders and hazardous consumption patterns (Saunders et al, 1993b; Piccinelli et al, 1997).

Cannabis Use: Respondents were asked questions about their first experience of cannabis, and patterns and experiences of regular use. These included: age of regular cannabis use, typical pattern and route of use, type of cannabis used, context of use, reasons for use and effects experienced. They were also assessed on compulsive use, source and cost of cannabis, self-reported problematic use; cannabis-related convictions and crime. Finally, respondents were asked to predict their use pattern in the next year (using questions based on

Prochaska and Diclemente's (1986) Stages of Change model).

Cannabis Dependence: Cannabis dependence was measured using four instruments.

(1) Substance Abuse Module of the Composite International Diagnostic Index (CIDI-SAM, Revision for DSM-IV Field Trial) (Robins, Cottler and Babor, 1990), provides lifetime and current DSM-III-R and ICD-10 diagnoses. A DSM-IV diagnosis can also be calculated. It is a lengthy, detailed and structured interview which can be administered by trained lay interviewers. The CIDI-SAM has been extensively used, and along with the shorter CIDI-Core interview, is frequently considered the "gold-standard" of dependence measures. There is good evidence for the reliability of the CIDI-SAM (Cottler et al., 1989; Langenbucher et al., 1994). The first author was trained and accredited to administer this instrument.

(2) the University of Michigan Short CIDI (UM-CIDI) (Kessler et al., 1994), a nine item version of the UM-CIDI used in the US National Comorbidity Survey (Wittchen & Kessler, 1994). This is a modification of the CIDI, which calculates a DSM-III-R dependence diagnosis for the last 12 months. The wording of the short form of the UM-CIDI has been altered slightly to aid comprehension. Two additional questions addressing persistence of behaviour have been added to the seven core questions, and these were not present in the original CIDI. There is no published data on the reliability or validity of the short or long version of the UM-CIDI (Kessler, personal communication 1997).

(3) the Ontario Adult Drug Use Questionnaire (Adlaf, Ivis and Smart, 1994), a 10 item scale which operationalises the ICD-10 dependence criteria for the last 12 months. The occurrence of at least three out of the six criteria in this period are required for a dependence diagnosis; and

(4) the Severity of Dependence Scale (SDS), a five item scale which assesses a limited number of dependence symptoms in the past 12 months (Gossop, et al., 1992). This scale was originally developed to assess the role of route of administration in the development of dependence among opiate, cocaine and amphetamine users. The scale was not meant to encompass the full spectrum of the dependence syndrome, but to be sensitive to elements of dependence which may vary among different drug-using populations. It focuses on the degree of "psychological" dependence, or compulsive use, as evidenced by concern over impaired control. It was included to investigate its applicability to a cannabis-using population, and because its simplicity indicates its potential clinical utility. It has been found to have good psychometric properties with samples of heroin, cocaine and amphetamine users in the UK and Australia (Gossop et al., 1995).

For each instrument, questions were asked only in relation to cannabis use. The CIDI-SAM and the short form of the UM-CIDI were administered by the first author, while the remaining two instruments were self-completed.

Health: The interview incorporated questions from the 1995 Australian National Health Survey (Australian Bureau of Statistics, 1996) on medical conditions and health service utilisation were included. These were: hospitalisation in the last year, consultation with doctor or specialist in the last two weeks, existence of long-term medical conditions, whether

long term conditions were caused by an accident, and experience of wheezy or whistly chests. Other questions assessed consultations with mental health professionals, and perceived health benefits and problems caused by cannabis use. Current psychological well-being was measured by the Symptom Checklist-90, Revised Version (SCL-90R) (Derogatis, 1994). This instrument was self-administered and assessed psychological symptom patterns in a variety of areas of functioning in the past 7 days.

Treatment Issues: Questions asked whether they had ever attempted to cut down or quit cannabis use, and if so their reasons for doing so. Respondents were also asked about any treatment experiences or ways in which they had moderated their own use, and reasons for relapse. Respondents' beliefs about desirable interventions for problematic cannabis use were also assessed.

2.4 Procedure

Interviews were conducted between July, 1995 and June, 1996. When a person expressed interest in participating, they were informed the purpose of the study was to find out more about the patterns of use and experiences of long term cannabis users, and whether people were experiencing any problems with the drug. They were administered a brief screening questionnaire to ensure that they met the criteria for inclusion in the study. Once this was established an interview was arranged at a time and place to suit the respondent. Some interviews were conducted at NDARC, although the majority were carried out in neutral locations such as hotels, cafes, parks, shopping centres, and occasionally in people's homes.

Upon meeting, the respondent was asked to read and complete a consent form, a copy of which they were given to keep, indicating that they were willing to participate in the research. Confidentiality of data was guaranteed, as was the anonymity of their participation. Subjects were asked whether they would be willing to be reinterviewed in approximately one year, in order to see if their views or experiences of cannabis use had changed. All respondents agreed, and provided contact details which were written on the interviewer's copy of the consent form. The interview was identified only by number, which was linked to the consent form to facilitate future data collection.

The interview took a mean of 49 minutes to complete (range: 30-80 minutes). Respondents were thanked and reimbursed up to $20 for costs incurred in attending the interview. Frequently they expressed approval that research was being conducted on cannabis, or asked for further information on the effects of the drug. A small number were referred to alcohol and other drug information services for referral to treatment. Interviews were kept in a locked filing cabinet, and identifying information and consent forms were kept in a separate locked cabinet. Only the interviewer had access to any of this information.

2.5 Data Analysis

Descriptive analyses and multivariate analyses were conducted using SPSS for Windows (Version 6.0). Principal components analyses of the items comprising the Severity of Dependence Scale were conducted using the Factor module of SPSS for Windows. Principal components analyses of the items comprising the UM-CIDI and the criteria comprising the ICD-10 and DSM-III-R diagnoses of dependence were conducted using tetrachoric correlation matrices entered into the Factor module of SYSTAT6. Receiver Operating Characteristic (ROC) analyses were conducted using software written as a macro (B. Carter, F. Shann, Royal Children's Hospital, Parkville, Victoria) within the SYSTAT package. Dependence diagnoses from the CIDI-SAM were calculated from a purpose-written program which yielded diagnoses of abuse and dependence (SAM-IV Scoring Program: designed by Douglas Mager, Washington University Medical Center). Crosstabulations of relevant comparative NHS data were purchased from the Australian Bureau of Statistics for the analyses of health status.

Descriptive analyses are presented for all major variables. Percentages are reported for categorical variables, while means and medians are reported for normally distributed and skewed continuous variables, respectively. A number of univariate comparisons of major variables of interest identified from the literature are reported. Unadjusted odds ratios (OR)

and 95% confidence intervals (95% CI) are presented for some categorical data, and t-tests or Pearson's product moment correlations are presented for continuous variables.

A limited number of multivariate analyses were conducted to investigate major variables of interest. Logistic regression models were estimated for categorical outcome variables, with backward elimination of variables according to the Likelihood Ratio Test (Hosmer and Lemesow, 1989). Multiple linear regressions were constructed for continuous outcome variables, and analyses of the residuals were performed to test for violations of the assumption of normality.

CHAPTER 3

RESULTS

3.1 Demographics

The demographic characteristics of the sample are presented in Table 2. Two hundred long-term cannabis users (58% male) were interviewed. The mean age was 28 years (median= 27); men were significantly older than women (mean of 30 versus 26 years; t_{197}=-3.9, p<0.0001).

The majority of respondents were Australian born (85%); five percent identified themselves as Aboriginal or Torres Strait Islanders (ATSI). The sample were quite well educated - 54% had completed six years of high school, while 86% had completed at least four years. More than half (60%) had completed some form of further education - 26% had completed a non-University tertiary course, 21% had a trade qualification and 20% possessed a University degree. There were no significant gender differences in the likelihood of having tertiary qualifications (52% of women vs 65% of men).

Fifty six percent of the sample were currently in full-time, part-time or casual employment. Eight percent were self-employed. Just under a third were unemployed (30%) and a further 10% were receiving government benefits or a pension. A substantial minority of the sample were students (19%). The main source of income was fairly evenly split between employment (45%) and government benefits (46%), with small proportions receiving income from Austudy (8%), and their partner or family (3%).

Living arrangements were variable. Most commonly, respondents reported living with friends (29%) or with their partner only (22%). Nineteen percent reported living with relatives, 11% lived alone and 10% lived with their partner and child(ren). Less than ten percent lived in share households (9%) or were single parents and lived solely with their children (6%; all women). More than half the sample (59%) were currently in a relationship, while 16% were currently living with children under 16 years of age. Women were significantly more likely to report being in a relationship (68% vs 52%; χ^2, 1df=5.2, p=0.02) and to be living with dependent children (25% vs 9%;χ^2, 1df=10.0, p=0.002).

Respondents were recruited from all areas of Sydney. Twenty percent lived in the inner-city areas, 23% in the inner western suburbs and 11% in the eastern suburbs, while 14%, 16% and 18% lived in the suburbs north, west/south-west and south of Sydney, respectively.

Table 2: Demographic characteristics (n=200 unless specified)

Variable	**Total**	**Men**	**Women**
Gender (%)	100	58	42
Age (yrs)			
mean	28	30	26
(range)	(17-57)	(19-57)	(17-45)
Country of birth (%)			
Australia, non-ATSI	81	81	81
Australia, ATSI	5	4	5
Born overseas	15	15	14
Highest school education (%)			
2ndary, 1-3yrs	14	16	11
2ndary, 4yrs	25	24	25
2ndary, 5yrs	7	7	7
2ndary, 6yrs	54	53	55
Tertiary qualifications (%)	60	65	52
Employment status (%)			
student	19	13	26
full-time work	28	27	30
part-time/casual work	22	17	27
self-employed	8	12	1
unemployed	30	33	26
pension/benefits	10	10	10
Living situation (%)			
alone	12	16	5
partner	22	21	23
partner & children	10	10	11
children only	6	0	14
relatives	19	18	19
friends	29	27	31
share household	9	10	7
Currently in relationship	59	52	68
Live with dependent children	16	9	5

3.2 Cannabis Use

3.2.1 Patterns of Past Use

The median age of first cannabis use was 15 years for both men and women. Typically, the first use occasion was the smoking of a joint (55%) or a bong (41%). Initiation typically occurred with friends (77%), with small proportions introduced to cannabis by relatives (13%) or their partner (6%). Five percent of the sample were introduced by other people, such as work or sporting colleagues, neighbours or strangers. While most used cannabis alone on this occasion (80%), 19% had used it in combination with alcohol.

The main reason for trying cannabis was curiosity, or the belief that it looked like fun (61%). At least one in ten claimed to have tried it because it was offered or available (15%), because everybody else was doing it (12%) or because of peer pressure (10%). Three percent claimed they were bored, while 6% provided a variety of other reasons, including rebellion, as a bet, or to attract the opposite sex.

Regular cannabis use (defined as at least weekly use) had commenced at a median of 17 years for both men and women. Respondents had been using regularly for an average of 11 years. Men had been using regularly for significantly longer than women (mean of 12 years for men and 9 years for women; t_{198}=-4.3, $p<0.001$), which partly reflects the different entry criteria for the study. Only 9% of men and 10% of women had been using for the minimum possible time to allow entry into the study (at least 3 years for women and 5 years for men).

3.2.2 Patterns of Current Cannabis Use

Patterns of cannabis use are presented in Tables 3 and 4. More than half the sample reported they typically used cannabis daily (56%), and three quarters (74%) used at least 4 times a week. One in five respondents used 2-3 times a week (20%), while only 7% used weekly. There were no gender differences in typical frequency of cannabis use.

Virtually all the sample reported that their current cannabis use was typical (84%), and this had been the case for at least a year in 96% of cases, and more than 5 years in 51% of cases. Current use was less frequent than usual for 13% and more frequent for 4% of the sample. Atypical use had been occurring for a year or more in one third of these people (34%), with 50% of them having used in this manner for less than 6 months.

The most common route of administration was smoking in a bong or waterpipe (83%), followed by smoking joints containing a mixture of cannabis and tobacco (16%) or cannabis only (13%). A small proportion smoked using a chillum or pipe (6%), while only 2% regularly ate cannabis. Not surprisingly, the sample preferred to use the "heads" of the cannabis plant (93%), with approximately one in five regularly using leaf (22%). Only small proportions regularly used a mixture of heads and leaf (4%) or hash (5%). The majority of respondents (75%) typically mixed cannabis with tobacco, while one person mixed with parsley. The cannabis smoked contained a median of 30% of tobacco.

All respondents had used cannabis in the previous month. "Cones" (i.e., bongs) were the most common method of recent consumption (84% of the sample), while 23% had smoked joints and 2% had eaten it. Consumption was measured using the OTI, and "raw" OTI scores were

standardised using the concept of "standard cones", as these were the most common method of consumption. According to this classification, one joint is equivalent to three "standard cones" (see Didcott et al, 1997 for a discussion of standardisation issues). A median of 6 "standard cones" per day had been smoked in the previous month, with respondents smoking from 0.1 to 50 standard cones. There were no significant gender differences in amount smoked.

The most popular location of use was in the respondent's home (93%), although a substantial proportion used at other people's homes (67%) or in public places (41%) such as pubs, clubs or natural settings such as national parks. Just over one in ten (13%) smoked in cars, while only 2% volunteered that they smoked at work. Three percent said they would smoke anywhere.

Table 3: Patterns of cannabis use (n=200 unless specified)

Variable	**Total**	**Men**	**Women**
Average Frequency of Use (%) (n=198)			
daily	56.1	59.6	51.2
4-6 times/wk	17.7	18.4	16.7
2-3 times/wk	19.7	17.5	22.6
once/week	6.6	4.4	9.5
Age of First Use (yrs)			
median (mean)	15 (15)	15 (15)	15 (15)
range	5-33	5-33	9-23
Age of Regular Use (weekly+) (yrs)			
mean	17.6	18.0	17.0
median	17.0	17.0	17.0
range	7-37	7-37	12-28
Number of Years Regular Use			
mean	11	12	9
range	3-30	5-30	3-24
Is current use typical? (n=199)			
yes	83.9	87.9	78.3
no, more frequent	3.5	1.7	6.0
no, less frequent	12.6	10.3	15.7

Evening (41%) and night (47%) were the favoured times to smoke, although one quarter (23%) would smoke during the afternoon. A further 11% smoked in the morning, while 10% said it varied. One in five (19%) said they would smoke "anytime", while 8% claimed to smoke all day. There were no gender differences in the likelihood of smoking all day or at

anytime, compared to other times.

The majority of the sample smoked with friends (83%), although more than one third smoked alone (39%) or with their partner (63% of those in a relationship). One in ten would smoke with relatives, while few would smoke with strangers (2%) or a variety of other people(3%), such as musicians, flatmates or "anyone". Three quarters (79%) of those with partners said that their partner smoked cannabis; women more often than men (88% vs 70%). Most often they said that their partner did not mind their use of cannabis (73%). While 15% believed they disapproved, 9% said their partner approved of their use.

Less than one third of the respondents with dependent children (30%) smoked with or in front of their children. Approximately half of this group felt their children did not know about or understand their cannabis use; and 22% felt that their children did not mind. Sixteen percent felt it depended on which child they were talking about, while 3% felt their children disapproved of their smoking.

3.2.3 Reasons for Use

The most common reasons given for cannabis use were to unwind, relax, obtain stress relief or to assist with sleep (60%), while 40% enjoyed the feeling of being stoned, and said it made them feel good. A further 18% said they used out of habit, or because they were addicted, while 17% used to relieve negative mood states or as an escape or aid in problem solving. More than one in ten used it as a substitute for other drugs, either because they didn't like or couldn't use them or because they perceived cannabis to be "better" in some way (12%), or as a way of "realigning their consciousness", altering perceptions and enhancing their creativity (11%).

3.2.4 Experiences of Use

When asked how cannabis affected them, the most common response was a feeling of relaxation and calm (33%). While 27% responded that they just "felt stoned", 21% reported tolerance to at least some of its effects. More than one in ten also claimed that use made them feel tired, helped them sleep, or made them feel lazy or demotivated (15%), while 12% said it relieved negative mood states or acted as a mood enhancer. Less than one in ten reported the following effects: altered and/or enhanced perceptions and senses (8%), paranoia or other negative mood states (8%), impaired reaction time, coordination and functioning (5%), introversion (5%), increased motivation and confidence (4%), hunger (3%) and memory impairment and vagueness (2%). Five percent said the effects were variable. Again, a small proportion (7%) listed a number of idiosyncratic effects, such as phantom body pains, asthma, sore lungs, headaches, sexual arousal, feeling "normal", becoming loud and losing weight.

Respondents were asked to describe some good things about their cannabis use, and some of the things that they didn't like, or were not so good. The most commonly mentioned "good things" about cannabis use was that it was relaxing, stress relieving, and calming (60%), followed by its ability to provide a change of consciousness, enhanced senses and creativity and a new perspective (40%). Approximately one quarter liked its mood enhancing effects (28%), or found it a social drug (27%), while about one in five enjoyed the feeling of being stoned (17%).

Table 4: Context of cannabis use (n=200 unless specified)

Variable	Total	Men	Women
Usual method (%)			
bong/waterpipe	83.0	81.9	84.5
joint, cannabis only	13.0	13.8	11.9
joint, cannabis & tobacco	15.5	17.2	13.1
chillum	6.0	5.2	7.1
eaten	1.5	0.9	2.4
Those who mixed with tobacco (%)	75.3	72.6	79.0
median amount of tobacco	30	25	33
Kind of cannabis (%)			
heads	93.0	94.0	91.7
leaf	22.0	21.6	22.6
hash	4.5	6.0	2.4
mixture of heads & leaf	4.0	1.7	7.1
Location of use			
home	92.0	90.5	94.0
other person's home	67.0	67.2	66.7
work	1.5	2.6	0
public place	40.5	45.7	33.3
in a car	12.5	12.1	13.1
Time of day			
morning	11.0	12.1	9.5
afternoon	23.0	26.7	17.9
evening	40.5	46.6	32.1
night	47.0	39.7	57.1
all day	8.0	9.5	6.0
anytime	19.0	17.2	21.4
varies	9.5	11.2	7.1
Smoke with...			
alone	38.5	38.8	38.1
partner	37.5	27.6	51.2
friends	83.0	82.8	83.3
relatives	9.0	6.9	11.9
strangers	1.5	2.6	0
Partner smokes (n=117)	78.6	70.0	87.7
Smoke with/in front of children (n=37)	29.7	25	33.3

Negative aspects of use were more varied, with no response endorsed by more than one in five of the sample. Eight percent of the sample said there were no negative aspects of use. The most frequently cited negative aspect of use was the cost or financial problems associated with acquiring the drug (21%). More than one in ten cited paranoia (16%), its illegality and periodic supply problems (15%), possible respiratory effects (14%), demotivation, lethargy and neglect of other activities (14%) and mental confusion, memory loss and vagueness (12%).

3.2.5 Cues to Use

Respondents were asked if there were any particular situations or feelings they experienced which they associated with a desire to use cannabis. While 18% replied there was nothing in particular, the majority provided at least one "cue" to use. The two most common cues to use were negative mood states such as stress, and coming home at the end of the day to relax (both 30%). Sixteen percent of the sample cited social situations, particularly being around other smokers, while 13% said that they craved cannabis when they were bored or restless.

3.2.6 Compulsive Use

Respondents were also asked how frequently they smoked beyond the stage where they had managed to achieve the feeling or state of mind they wanted; this was an attempt to assess compulsive use or "impaired control" over use. Just over one quarter (28%) did this at least often, while 32% did this sometimes. One quarter (27%) claimed never to smoke beyond intoxication, while 13% did so rarely. The reasons for such "compulsive" use were varied, although they centred around three situations: being in social situations or with other smokers (33%), because they enjoyed the act of smoking, they were "greedy" and/or wanted to prolong the effect (18%) or because there was a lot of good quality cannabis available (17%).

Most commonly, respondents were aware of experiencing acute tolerance to the effects of cannabis in these situations. Thus, 50% stated that they reached a certain point beyond which the effect did not increase, and often mentioned that they "smoked themselves straight" or that they knew it was a waste. One in five (20%) claimed they felt incredibly tired or lazy, or just fell asleep, while 12% experienced disorientation, difficulty functioning or passed out. Two percent said they were physically ill when they did this. Only 6% claimed that the effect improved, while 7% said it was variable. A couple of respondents (2%) noted increased paranoia, or felt it was quite safe as overdose was not possible.

Half (51%) the sample reported that they went on cannabis "binges" (described in an analogous manner to alcohol binges). Men were no more likely to binge than women (46% vs 56%).

3.2.7 Source

The majority of the sample bought their cannabis from friends, relatives or acquaintances (70%), and one third bought from dealers (36%) (friends were sometimes also dealers) (see Table 5). One in five (19%) grew at least some of their own cannabis. Of those who could provide a percentage estimate, those that grew cannabis grew a median of 27% of their supply. This was often difficult to estimate, because a number of people were growing only one or two plants. One in ten respondents received cannabis as a gift (12%), while a minority received it as payment for services (2%).

In general, cannabis was considered easy or very easy to get (80%). Only 7% found it quite or very difficult, while 14% said availability varied. Cannabis was most frequently purchased in small deals of between $20 to $50 (49%), which they reported between one and two grams. Almost one in four would buy up to one quarter of an ounce (23%), 6% between one quarter and half and ounce, while 14% purchased an ounce or more. This included two people who purchased 1kg (which lasted 9 months) and 12oz (which was one year's supply). A small proportion (7%) purchased variable quantities, depending on availability, finances, quality and smoking context.

Information on the price of an ounce was obtained from almost one third of the sample (31%), but was not easy to quantify because of the range of prices stated. Almost all (93%) estimates fell between $350 and $500 an ounce, but 7% reported paying less than $300. Thirteen percent said it was too variable to give a range. Estimates varied according to the quality (e.g., "normal" heads, hydroponics or organic) and the source of the cannabis (e.g., irregular contacts, regular dealer or friends who grow cannabis on the North Coast).

Information was also collected on what respondents did when there were problems with cannabis supply. Seventeen percent said that cannabis was never or rarely in short supply. When the drug was in short supply the remainder typically did one of two things: they either were not worried and/or moderated their use, or they sought alternative sources. Thus, while some claimed that they didn't smoke or smoked less (16%) or that they didn't let it bother them (15%), others claimed that they found another source (17%), or that they became anxious or panicky and made efforts to search for it (13%). Smaller proportions substituted other drugs (6%), planned ahead by putting some aside or eked out their own supply (5%), or they supplemented their source with home grown cannabis (4%). Supply problems were frequently mentioned around the Christmas and New Year period.

3.2.8 Criminal Activity

One in five respondents (21%) had a cannabis-related conviction (see Table 5). This was primarily for possession (20%), with very few having convictions for dealing (3%) or growing (4%). Men were more likely than women to have convictions (31% vs 7%; χ^2, 1df=16.8, p<0.001).

The majority of respondents (79%) claimed to have committed a cannabis-related offence (other than possession) that had gone undetected.,This was also more common among men than women (85% vs 69% of women; χ^2, 1df=9.7, p=0.006). The most common undetected offence was growing (69%) and dealing (48%). Only five percent of the sample had spent time in juvenile detention for any reason (median 5 months). One in ten had spent time in gaol (11%; median of 2 months). Men were more likely than women to have been imprisoned as a juvenile or an adult (18% vs 7%; χ^2, 1df=5.0, p=0.03).

Table 5: Cannabis Supply and Criminal Activity (n=200 unless specified)

Variable	Total	Men	Women
Usual supply (%)			
grow own	18.5	21.6	14.3
buy from dealer	36.0	41.4	28.6
buy from friends or relatives	69.5	64.7	76.2
gift	11.5	11.2	11.9
payment for services	2.0	2.6	1.2
How easy to get (%) (n=199)			
very easy	51.3	55.7	45.2
easy	28.6	22.6	36.9
quite difficult	4.0	3.5	4.8
very difficult	2.5	2.6	2.4
it varies	13.6	15.7	10.7
Cannabis-related convictions (%)			
none	79.0	69.0	92.9
growing	4.0	6.9	0
dealing	3.0	4.3	1.2
possession	20.0	29.3	7.1
Undetected cannabis-related crime (%) (n=199)			
none	21.6	14.8	31.0
growing	68.8	74.8	60.7
dealing	48.2	53.0	41.7
property crime	5.5	6.1	4.8
crime against person	0.5	0.9	0
fraud	1.0	1.7	0
Spent time in juvenile detention (%)	5.0	6.9	2.4
Spent time in gaol (%)	10.5	14.7	4.8

3.2.9 Predicting Use in Next Year

Respondents were asked to describe their feelings about their cannabis use over the next twelve months, from a list of statements which approximated the stages in the Stages of Change Model (Prochaska and Diclemente, 1986). This model describes the stages through which a person moves in an attempt to resolve a AOD problem, and was incorporated in an attempt to relate level of cannabis dependence to consumption one year after the initial interview. While initially, all four statements referred to stopping, several respondents were only concerned with cutting down their cannabis use, so each statement had both the "stop" and "cut down" option.

The majority of respondents (56%) claimed they were not thinking of stopping, while a further 2% specified they did not even wish to cut down (equivalent to the Pre-contemplation stage of the model). The predominant reasons provided for the desire to continue with the current smoking pattern were enjoyment (61%), or because it was not perceived to be interfering or causing a problem with the respondent's life, there was no perceived reason to stop, and its use being a part of their lifestyle (56%).

The next most frequent response was that they would like to stop or cut down, but they were not sure if they were ready (12% and 9% respectively), the Early Contemplation stage. The reasons provided were varied. One third wished to moderate their use because they were spending too much money on it, or needed to save, while one in five (19%) had concerns that they were wasting their life or that they had things they wanted to do, were concerned over their health, or felt they were addicted or reliant on the drug and had difficulty stopping.

Seven percent were preparing to stop using, while a further 3% were preparing to cut down (the late Contemplation stage). Again, this was predominantly because of concerns over the wasting of otherwise valuable time and money, and concern about family, partner or work issues (each 28%). A further 22% expressed health concerns, while 11% said it was doing them more harm than good. Finally, 5% were currently doing something about their use when interviewed, with most stopping. Again, this was for the same sorts of reasons specified above. Only 7% did not know what they would do in the next 12 months.

Women were significantly more likely than men to express a desire to change their behaviour, with 47% wanting to, or doing something about stopping or cutting down (compared to 32% of men; χ^2, 1df=4.5, p=0.03).

3.3 Other Drug Use

The entire sample had tried at least two drugs other than cannabis (range: 2-10) (see Table 6). Alcohol (99.5%), tobacco (94%), hallucinogens (92%) and amphetamine (90%) had been tried by 90% or more of respondents. More than half had also tried cocaine (64%), inhalants (53%) and heroin (52%), while half had tried benzodiazepines. The only drugs tried by fewer than half the sample were opiates other than heroin (20%) and barbiturates (17%). The average number of drug classes (excluding cannabis) ever used was 6, with nearly half (45%) having used at least 6 drugs. Men had tried a significantly greater number of drug classes than women (mean of 6.6 vs 5.9; t_{198}=-2.5, p=0.02).

All but two respondents (99%) had been at least monthly users of other drugs. The drugs most frequently used on a regular basis were alcohol (88%) and tobacco (84%). Less than half the sample had regularly used the other drug classes, with the most commonly used being amphetamine (43%), hallucinogens (39%) and heroin (22%). A mean of 3 drug classes (excluding cannabis) had been used regularly (range: 0-10). There were no gender differences in number of drug classes regularly consumed (mean of 3.4 for men and 3.1 for women). Only 6% had never smoked a cigarette, 23% were ex-smokers and 71% were current smokers.

Polydrug use in the month prior to interview was the norm, with 95% of the sample having

used a mean of 2 drug classes other than cannabis. There were no gender differences in the number of drugs used in the last month. The most frequently used drugs were alcohol (87%) and tobacco (71%), although approximately one in ten had used hallucinogens (15%), amphetamine (14%) or heroin (11%).

Table 6: Frequency of other drug use (n=200 unless specified)

	Ever Use	**Regular Use***	**Use in Last Month**
Alcohol	100	88	87
Tobacco	94	84	71
Hallucinogens	92	39	15
Amphetamine	90	43	14
Cocaine	64	13	6
Inhalants	53	11	2
Heroin	52	22	11
Benzodiazepines	50	17	9
Other opiates	20	9	1
Barbiturates	17	6	0

* regular use=at least monthly

3.3.1 Combined cannabis and other drug use

Cannabis had frequently been used in combination with other drugs (excluding tobacco) on a regular basis (at least monthly), with 87% of respondents having done so. Thus, three quarters (71%) had ever used alcohol and cannabis together regularly, while approximately one third had a similar pattern with amphetamine (39%) and hallucinogens (32%). Respondents had used cannabis regularly with a mean of 2 other drug classes (range: 0-9). Again, there were no gender differences in combined drug use.

Cannabis and alcohol were frequently used in combination, with 75% having used in this way at least monthly. Of those who used them together, one third claimed they smoked first (33%), one quarter they drank first (25%) and 40% that the order varied. Only 3% used at the same time. There were fairly marked differences in the consequences of combined use depending on the order in which these two drugs were used. The most dramatic effects occurred when alcohol was consumed first, particularly if the respondent was drunk. Typically, smoking after alcohol consumption reportedly increased intoxication, and more often had adverse consequences. Thus, while 30% of those who drank first reported that they simply became more intoxicated, 25% claimed they experienced nausea or vomited and 23% claimed they "spun out", "lost it" or were "wiped out". Only 14% said the combination had no effect, while 3% described the combination as good. Three percent said they went to sleep.

In general, respondents were less able to describe the effects of smoking cannabis before drinking alcohol but those who did reported that it produced less marked or adverse effects. While 40% said smoking first enhanced the effect or brought it on more quickly, 18% said they felt more in control or that the effect was less heightened. One quarter (26%) said this

combination had no effect on intoxication.

Respondents could more readily describe the effect of smoking first on the amount of alcohol consumed than vice versa. Two thirds (65%) said that if they smoked first they consumed less alcohol, or drank it more slowly. One quarter (26%) said it had no effect , while only 9% said their consumption increased. One half of respondents (52%) said that consuming alcohol first had no effect on their smoking, while one third (31%) said they smoked less. Sixteen percent said they would smoke more.

Just over half (57%) said they currently regularly combined cannabis with other drugs. The main reasons for doing so were that cannabis enhanced the effects of other drugs, that the combination brought either drug "on" (28% of whole sample), or that they were available in the same place at the same time, usually in a social situation such as a party (25%). Cannabis was also used to help "come down" off other drugs and as an aid to sleeping when coming down (17%).

3.3.2 AUDIT

Those who had consumed alcohol in the last year completed the AUDIT, which provided a measure of the potential harm caused by their drinking patterns (see Table 7). Almost half the current drinkers (48%) typically consumed alcohol on at least two days a week, with 30% drinking weekly or less and 22% monthly or less. Men more commonly reported drinking alcohol at least twice weekly (53% vs 41% of women), while almost one third of the women drank less than monthly (32% vs 15% of men).

Typically, at least 3 standard drinks were consumed by the majority of current drinkers (79%). Using National Health and Medical Research Council (NH & MRC) (Pols and Hawks, 1992) criteria for determining hazardous or harmful drinking levels, 49% of men were drinking at least hazardously (more than 4 standard drinks per day), while 73% of women were classified in this way (more than 2 standard drinks per day). One third of this group (34%) consumed six or more drinks on one occasion at least weekly, with this behaviour more common among men than women (43% vs 21%). Women were much more likely to report they never did this than men (18% vs 5%).

Substantial minorities cited problems related to alcohol use: 36% said they had been unable to stop drinking once they had started, while 38% said they had failed to do what was expected of them because of drinking, although usually less than monthly. Forty three percent claimed they were unable to remember what happened the night before because they had been drinking, while 41% had felt guilt or remorse. These symptoms usually occurred less than monthly. A small proportion (9%) claimed to have needed a morning drink to get going after a drinking session.

One third had injured themselves or someone else as a result of their drinking (34%). This was most often more than a year ago, and more often among men than women (41% vs 26%). A similar proportion (31%) reported that a friend, doctor or other health worker had been concerned about their drinking or had suggested they cut down, with just under half of these having occurred in the last year.

The average score on the AUDIT was 11, with men scoring significantly higher than women

(12 vs 9; t_{187}=-2.97; p=0.003). Using the cut-off recommended by the WHO, whereby a score of 8 or more indicates problematic drinking, 60% of the sample (67% of men and 50% of women) displayed problematic patterns of alcohol consumption. Among those who had consumed alcohol in the past year, this figure was 64%. Men were significantly more likely to have been drinking at dangerous levels than women according to these criteria (70% for men and 54% for women; χ^2, 1df=5.3, p=0.02). Using the alternative Australian cut-off (Conigrave et al, 1995), which attempts to account for gender differences in consumption (a score of 6 or more for women and 7 or more for men), 69% of the sample were classified as problematic drinkers (71% of men and 67% of women). Among drinkers, this figure was 73%; there were no gender differences according to these criteria (74% of men and 72% of women).

There is limited comparative data on Sydney samples interviewed on the AUDIT. Nevertheless, the proportion of cannabis users exceeding the WHO cut-off was far greater than that found in a sample of 350 ambulatory care patients attending a Sydney hospital emergency department in 1984-5 (Conigrave et al, 1995). This study found that 37% were classified as hazardous or harmful drinkers.

3.3.3 Other Drug Problems/Treatment

Just under half the sample (47%) claimed to have experienced a problem with or sought treatment for a drug other than cannabis; there were no gender differences (43% of men vs 51% of women). This drug was most commonly alcohol or amphetamine (both 27% of the sample), followed by cocaine and heroin (both 14%). Twelve percent of the sample had experienced a problem with more than one drug. The most recent experience was a median of 12 months ago.

One in five respondents (20%) had been to a treatment program for such a problem, predominantly methadone maintenance (9%) or detoxification facilities (6%). There were no gender differences in help-seeking (20% of men vs 19% of women).

It was not uncommon for respondents to have family histories of AOD problems, with 46% of men and women reporting that at least one family member had such a problem during their childhood. Sixteen percent reported a maternal AOD problem, most commonly with alcohol (14%), while 31% reported a paternal problem, usually with alcohol (26%). A smaller proportion reported a fraternal AOD problem (7%), and again this was most likely to be alcohol (4%).

Table 7: Alcohol consumption data obtained from the AUDIT (current drinkers; n=189)

Variable	**Total (%)**	**Men (%)**	**Women** (%)
Drinking Frequency			
< monthly	22.2	15.3	32.1
< weekly	29.6	31.5	26.9
2-4 times/wk	35.4	36.0	34.6
5+ times/wk	12.7	17.1	6.4
No. of Standard Drinks			
1	3.7	2.7	5.1
2	17.5	14.4	21.8
3 or 4	37.0	34.2	41.0
5 or 6	22.8	25.2	19.2
7 or more	19.0	23.4	12.8
Six or more drinks			
never	10.6	5.4	17.9
< monthly	29.1	26.1	33.3
monthly	26.5	25.2	28.2
weekly	29.1	36.0	19.2
daily/almost daily	4.8	7.2	1.3
Injured self or someone else			
no			
yes, >1 yr ago	65.1	58.6	74.4
yes, in last year	21.2	26.1	14.1
	13.8	15.3	11.5
Others concerned about drinking			
no	69.3	62.2	79.5
yes, >1 yr ago	18.0	22.5	11.5
yes, in last year	12.7	15.3	9.0
AUDIT Score			
mean	11.2	12.4	9.5
median	10.0	12.0	8.0
range	1-34	1-34	1-28
Problem			
WHO definition*	64	70	54
Australian definition+	73	74	72

* WHO: a score of 8 or more for men and women
+ Australia: a score of 6 or more for women and 7 or more for men

3.4 Cannabis Dependence

3.4.1 The CIDI-SAM (DSM-III-R)

Information on the CIDI-SAM is presented in Table 8. Ninety two percent of the sample qualified for a lifetime DSM-III-R diagnosis of cannabis dependence, while 7% were diagnosed with cannabis abuse and 1% had no diagnosis. Similarly, 91% of the sample met an ICD-10 diagnosis of lifetime cannabis dependence. When the lifetime DSM-III-R diagnosis was categorised by severity, 20% had mild, 33% moderate and 40% severe dependence.

An average of 6 criteria were met (range: 0-9); women met a significantly greater number of criteria than men (mean of 6.1 vs 5.5 for men; t_{198}=2.1, p=0.04). All lifetime cases of dependence had commenced more than one year ago, at a median age of 16 years for men and women. The majority of both men and women with a lifetime cannabis dependence diagnosis were currently experiencing symptoms: 80% had experienced their most recent symptom of dependence within the last two weeks, and 95% within the last year.

The most frequently endorsed criterion was continued use despite knowledge of problems associated with use (94%). Approximately three quarters endorsed Criterion 4: frequent intoxication or withdrawal in inappropriate situations (80%), Criterion 7: tolerance (78%), Criterion 8: withdrawal symptoms (76%) and Criterion 3: great deal of time spent using or getting over effects (73%). More than half also endorsed Criterion 1: greater levels or duration of consumption than desired (59%). All other criteria were endorsed by at least one third of respondents. There were no gender differences in the likelihood of having experienced any criteria other than Criterion 7, with females more likely to report marked tolerance than males (86% vs 72%; χ^2, 1df=5.0, p=0.03).

The proportion endorsing withdrawal symptoms is higher than expected given the limited reports in the literature. The most frequently reported withdrawal symptoms on the respondent's worst occasion of withdrawal were anxiety/restlessness/irritability (74%), trouble sleeping (55%), disturbance in appetite (37%) and depression (33%). However, a wide variety of other symptoms had been reported by at least one in ten respondents, including: trouble concentrating (26%), tiredness (18%), sweating or fever (12%) and yawning (11%).

After the CIDI-SAM was administered, the sample were asked how confident they were that their experienced withdrawal symptoms were due to cannabis, and whether they had been using any other drugs at the time. One third (32%) of those who had experienced such symptoms said they were confident that symptoms were due to cannabis because they were consistent, while 10% said they were otherwise healthy and had no other symptoms. A further 10% said they were due to cannabis but provided no explanation for their belief. The remainder did not think this was the case, or believed cannabis was only partially responsible. Most often (75%), the respondent was not withdrawing from any other drug.

Half of both men and women had experienced at least one physical health problem (other than withdrawal symptoms) caused by cannabis use: the most common were persistent cough (34%), unintended weight loss (13%) and pounding heart (11%). The majority (87%) reported experiencing psychological problems caused by cannabis. These were mainly

paranoia (64%), confusion (44%), anxiety (39%) and being easily startled (35%).

Approximately two thirds of the sample (64%) had experienced a social problem related to use. Thus, cannabis had frequently caused problems with the respondent's family (43%) and the police (33%), and to a lesser extent with friends/doctors (20%), at work or school (21%) or had caused fights (8%). Men were significantly more likely to report such a problem than women (73% of men vs 50% of women; χ^2, 1df=11.4, p=0.008). Forty two percent of respondents believed cannabis had caused them to neglect housework or childcare, one in four (26%) believed it had caused them to miss school, be expelled from school or impaired their performance, and 13% believed it had caused them to miss work or be fired.

3.4.1.1 DSM-IV Approximation

The CIDI-SAM was re-scored to provide an approximation to a lifetime DSM-4 dependence diagnosis. This involved the following: removing the DSM-III-R Criterion 4; collapsing the DSM-III-R Criteria 8 and 9 to produce a single withdrawal criterion; and removing continued use despite social problems from DSM-III-R Criterion 6 so that the DSM-4 criterion reflected continued use despite physical or psychological problems only. While there were 9 DSM-III-R criteria, there were only 7 DSM-4 criteria. In addition to the re-scoring, questionnaires were hand-checked to ensure that the DSM-4 requirement of 3 criteria in any one year was met.

Three quarters (74%) of the sample met a lifetime diagnosis of DSM-4 dependence compared to the 92% that met a DSM-III-R diagnosis. The comparison between the diagnoses with the two criteria is presented in Table 9.

3.4.1.2 Methodological Note on Age of Onset and Recency

The scoring algorithms developed for the CIDI-SAM and the CIDI-Core involve calculation of the age of onset of dependence as being the age of onset of the first symptom of dependence. Likewise, recency codes report on the occurrence of the most recent dependence symptom (Mager, personal communication, 1996). However, in order to truly qualify for dependence, it is necessary to meet at least 3 of the 9 criteria. Thus, just because the age of onset of the first dependence symptom may occur at age 16, for example, does not mean that a cluster of at least 3 symptoms had occurred by this age. The convention for reporting age of onset may thus underestimate the age of onset. Again, the occurrence of the most recent symptom 2 weeks prior to interview does not imply that at least 3 symptoms were evident at this time. The convention for reporting recency may thus over estimate the recency of occurrence of the syndrome. The combination of these factors may lead to an overestimation of the chronicity of dependence in any individual. However, this would not have any impact on a lifetime diagnosis of dependence *per se*.

In order to examine how closely the conventional age of onset and recency codes matched the occurrence of at least 3 symptoms at the respective times stated, the CIDI-SAM data were hand scored. Age of onset could be estimated for only 105 of the 184 respondents meeting a dependence diagnosis - that is, the earliest age could be determined at which 3 or more symptoms were evident. While the median age of occurrence of the first dependence symptom was 16 years, re-scoring produced an amended true median age of onset of dependence of 18 years (range: 12-30 years). Recency of dependence could be determined for only 133 of the 184 respondents meeting a lifetime dependence diagnosis - that is, the

most recent period when 3 symptoms occurred could be determined. Of these, 52% qualified for a dependence diagnosis in the last 2 weeks, compared to the 80% whose most recent symptom of dependence occurred in this time. However, 88% met a dependence diagnosis in the last year, as 3 or more symptoms were

Table 8: Proportions (%) meeting lifetime DSM-III-R and ICD-10 meeting diagnoses, and each of the nine dependence criteria on the CIDI-SAM (n=200 unless specified)

Variable	Total	Men	Women
Lifetime DSM-III-R diagnosis			
severe dependence	39.5	36.2	44.0
moderate dependence	32.5	31.0	34.5
mild dependence	20.0	20.7	19.0
abuse	7.0	10.3	2.4
nothing	1.0	1.7	0
Number of criteria met			
mean	5.8	5.5	6.1
median	6	6	6
range	0-9	0-9	2-9
Most recent symptom (n=198)			
within last two weeks	78.8	77.2	81.0
Lifetime ICD-10 diagnosis			
dependence	91.0	88.8	94.0
nothing	9.0	11.2	6.0
Criterion 1 greater consumption, or duration than desired	59.0	56.0	63.1
Criterion 2 persistent desire, or unsuccessful efforts to cut down or control use	46.5	41.4	53.6
Criterion 3 great deal of time spent consuming, acquiring, or recovering	73.0	72.4	73.8
Criterion 4 frequent intoxication or withdrawal symptoms which impede major role obligations, or when use is physically hazardous	80.0	79.3	81.0
Criterion 5 important activities foregone due to use	32.5	30.2	35.7
Criterion 6 continued use despite knowledge of a social, psychological, or physical problem which is caused or exacerbated by use	94.0	94.8	92.9
Criterion 7 marked tolerance	78.0	72.4	85.7
Criterion 8 withdrawal	76.0	71.6	82.1

Criterion 9 use to avoid or relieve withdrawal	38.5	33.6	45.2

Table 9: Comparison between proportions (%) meeting lifetime DSM-III-R and DSM-4 diagnoses of dependence on the CIDI-SAM. Numbers in brackets represent the Criterion in the respective diagnostic systems.

Criteria	**DSM-III-R**	**DSM-4**
Taken in larger quantities/for longer periods than intended	(1) 59.0	(3) 59.0
Persistent desire/unsuccessful efforts to cut down	(2) 46.5	(4) 46.5
A great deal of time spent acquiring/using/recovering	(3) 73.0	(5) 73.0
Frequent intoxication/withdrawal when expected to fulfil obligations	(4) 80.0	(removed)
Neglecting important activities	(5) 32.5	(6) 32.5
Continued use despite social, physical or psychological problems	(6) 94.0	(7) 92.5*
Tolerance	(7) 78.0	(1) 78.0
Withdrawal	(8) 76.0	(2) 76.5#
Withdrawal relief	(9) 38.5	(2)
Dependent (3 or more criteria)	92.0	73.5$

* DSM-4: Removal of social problems
# DSM-4: Collapsed DSM-III-R categories 8 and 9.
$ Percentage meeting 3 or more criteria in a one year period.

experienced during this period (compared to 95% who had experienced their most recent symptom in the last year).

3.4.2 The Short CIDI (UM-CIDI)

According to the UM-CIDI, 77% of the sample qualified for a DSM-III-R diagnosis of dependence in the last year (see Table 10). This figure is close to the lifetime DSM-III-R dependence diagnosis. The mean score was 4, while the median probability of being diagnosed with dependence was 1. Seventy seven percent of the sample had at least a 0.75 probability of receiving a dependence diagnosis. Men were no more likely than women to receive a dependence diagnosis, and did not receive significantly higher scores on the questionnaire. Approximately two thirds of the sample reported tolerance (66%), spending a lot of time acquiring, using or recovering from using cannabis (66%), intoxication in situations where they could be hurt (64%) and intoxication at work, school or when taking care of children (63%). Approximately one half claimed to have used larger amounts of cannabis or for longer than intended (54%), to have an irresistible urge to use cannabis (46%) or to have psychological problems caused by cannabis (45%). It is possible that the proportion reporting intoxication in situations where the respondent could be hurt, such as driving, swimming and operating machinery, may be an underestimate, as many people believed that cannabis use was not dangerous in these situations.

3.4.3 Ontario Adult Drug Use Questionnaire (ICD-10)

Almost three quarters (72%) of respondents qualified for an ICD-10 diagnosis of dependence in the last year, with a mean of four criteria being met (see Table 11). There were no gender differences in the likelihood of receiving a diagnosis (76% of women vs 69% of men) or in the number of criteria met (mean of 3.7 for women and 3.5 for men).

The most commonly endorsed criterion (87%) was a strong urge or desire to use cannabis (Criterion 1), while more than half reported all other criteria except withdrawal. One third (32%) reported withdrawal symptoms or relief use of cannabis in the last year. There were no gender differences in the likelihood of experiencing each of the six criteria. As can be seen in Table 11, the prevalence of each criterion and the diagnosis of dependence is much greater among this sample than the population-based sample on which this questionnaire was developed.

When asked to provide an overall rating of the effect of cannabis on their life in the last year, 43% believed it had done them more good than harm, 35% believed the harm and good was about equal, 13% believed the harm outweighed the good and 10% did not know.

Table 10: Proportions (%) meeting a 12-month dependence diagnosis on the short CIDI (UM-CIDI); (n=200 unless specified).

Variable	Total	Men	Women
Intoxicated at work, school, while caring for children	62.5	61.2	64.3
Frequency (n=125)			
once or twice	10.4	11.3	9.3
3-5 times	10.4	12.7	7.4
6-10 times	9.6	7.0	13.0
11-20 times	12.8	18.3	5.6
>20 times	56.8	50.7	64.8
Intoxicated while in situation where could be hurt	64.0	66.4	60.7
Cannabis use caused emotional or psychological problems	44.5	44.8	44.0
Irresistible urge to use (n=199)	46.2	41.7	52.4
Spent a lot of time on pot	66.0	65.5	66.7
Often used larger amounts/for longer	54.0	49.1	60.7
Frequency (n=108)			
once or twice	13.0	17.5	7.8
3-5 times	16.7	15.8	17.6
6-10 times	16.7	17.5	15.7
11-20 times	15.7	15.8	15.7
>20 times	38.0	33.3	43.1
Tolerance	66.0	65.5	66.7
Dependent (n=199) (at least 3 symptoms met)	76.9	76.5	77.4
mean/median symptoms	4.0/4	3.9/4	4.2/4
mean/median probability	1/1	0.7/1	0.8/1
range symptoms/probability	0-7/0-1	0-7/0-1	1-7/0.05-1

Table 11: Proportion (%) of Sydney sample (n=200) receiving 12-month ICD-10 dependence diagnosis compared to Ontario population sample (n=2022).

	Cannabis Dependence Criteria	**Sydney**	**Ontario***
1.	Strong urge or desire to use cannabis	87	23
2A.	Started using cannabis when you had decided not to	43	10
2B.	Use cannabis for much longer than you intended	43	17
2C.	Tried to stop or cut down but couldn't (n=198)	33	6
	Percentage reporting one or more Criteria Two	61	19
3A.	Felt sick or found yourself shaking when you cut down or stopped	16	3
3B.	Took cannabis to get over bad after-effects of cannabis	28	2
	Percentage reporting 3A or 3B	32	3
4	Found that your usual amount of cannabis had much less effect than it once did (n=198)	62	17
5A.	Gave up or neglected other pleasures/interests in favour of cannabis (n=199)	44	10
5B.	Spent a lot of time on cannabis, getting over its effects, or doing things to get it (n=199)	49	7
	Percentage reporting 5A or 5B (n=199)	61	14
6A.	Kept on using cannabis despite a health problem caused/exacerbated by cannabis (n=199)	39	7
6B.	Kept on using cannabis although it was making you depressed, disinterested, suspicious or distrustful (n=199)	33	8
	Percentage reporting 6A or 6B (n=199)	52	11
	Percentage reporting dependency criteria (i.e., 3 or more of the 6 criteria) (n=198)	**72**	**13**
	Mean/median number of criteria met	**4/4**	**-**

*__Note:__ This sample is population-based. A cannabis user was defined as somebody who had used the drug at least once in their lifetime (Source: Adlaf, Ivis and Smart, 1994).

3.4.4 Severity of Dependence Scale

The mean SDS score was 4 and 39% scored at least 5 which classified them as dependent in the last year (see Table 12). There were no gender differences in SDS score (mean of 3.8 for men and 4.5 for women), although women were significantly more likely to have met the criteria for dependence than men (48% vs 33% for men; χ^2, 1df=4.5, p=0.03). More than half the respondents (53%) had at least sometimes felt their cannabis use was out of control in the last year, felt anxious at the prospect of not having cannabis (67%) or had wished they could stop (51%). Almost three quarters (72%) had worried about their use at least a little, while 56% believed they would find it at least "quite difficult" to stop or go without.

3.4.5 Cannabis Use as a Problem

One third of the sample believed they had a problem with their cannabis use. A further four percent believed they sometimes had a problem, while 5% were not sure. Women were no more likely than men to believe their cannabis use was at least sometimes a problem (41% vs 34%).

The main reasons cannabis was considered to be a problem were that they smoked too much or too frequently (34% of those with a problem), or that they depended on it, felt addicted or felt sick if they didn't have it (24%). Others felt they spent too much on it or had financial problems (17%), that it interfered with their life (14%), they had health concerns (13%) felt unable to stop or believed that stopping would be difficult (13%). Other reasons for considering cannabis a problem (14%) included its illegal status, the desire to be more responsible, the belief that it made you amoral, or that it led to the respondent smoking cigarettes.

Those who did not perceive their use to be a problem believed this was the case because they could control their use, could stop when they wanted or did not worry when it wasn't there (60% of those without a problem), that it wasn't harming anybody and they enjoyed it (24%), and that it didn't interfere with their functioning or lifestyle (19%).

Table 12: Proportion (%) of sample receiving 12-month dependence diagnosis on the Severity of Dependence Scale (n=200 unless indicated)

SDS Variable	Total (%)	Men (%)	Women (%)
Out of control			
never/almost never	46.5	50.0	41.7
sometimes	39.5	37.1	42.9
often	8.5	7.8	9.5
always/nearly always	5.5	5.2	6.0
Anxious without use			
never/almost never	32.5	37.1	26.2
sometimes	51.0	49.1	53.6
often	10.0	8.6	11.9
always/nearly always	6.5	5.2	8.3
Worry about use			
not at all	28.0	27.6	28.6
a little	57.0	59.5	53.6
quite a lot	10.0	8.6	11.9
a great deal	5.0	5.2	6.0
Wish to stop			
never/almost never	48.5	50.9	45.2
sometimes	37.0	35.3	39.3
often	10.0	8.6	11.9
always/nearly always	4.5	5.2	3.6
Difficulty stopping			
not difficult	44.0	49.1	36.9
quite difficult	35.0	35.3	34.5
very difficult	15.5	11.2	21.4
impossible	5.5	4.3	7.1
Dependent (Score more than 4)	39.0	32.8	47.6
mean	4.1	3.8	4.5
median	3.0	3.0	4.0
range	0-14	0-14	0-14

3.5 Health

Respondents were asked to provide their perceptions of any health benefits or health problems associated with cannabis use. These items provided comparative data to that collected on the general population's attitudes towards cannabis by Hall and Nelson (1995).

Cannabis was perceived to have health benefits by the majority of the sample, with 78% being able to provide, unprompted, at least one benefit. This was substantially more than the 23% who could identify benefits in Hall and Nelson's population sample. The most frequently perceived benefits among cannabis users were stress relief and an aid in getting to sleep (51%), followed by its psychological benefits (21%), its anti-nausea and appetite enhancing effects (17%) and its analgesic properties (15%). The three most commonly cited benefits among the general population were stress relief (12%), pain relief (4%) and psychological benefits (3%).

Health problems were also commonly recognised (86%) among cannabis users, and these were usually respiratory in nature, with a substantial minority also believing it was associated with negative psychological effects. The general response "respiratory problems" or cough were most frequently mentioned (49%), followed by the route of administration (smoking) or its use in combination with tobacco (24%). A further 10% cited lung or throat cancer, while 6% believed it could be associated with bronchitis.

More than one in ten (12%) believed it could cause paranoia, anxiety or panic, while 10% believed it heightened the risk for schizophrenia or other psychosis. More than half the general population identified health problems, with 62% identifying at least one. However, approximately one quarter (27%) were not sure if cannabis caused any health problems. The most frequently identified problems among this group were lung cancer (20%), mental problems (13%) and memory impairment (9%). There were no gender differences in whether cannabis was perceived as beneficial or problematic to health.

3.5.1 Comparison with 1995 National Health Survey (NHS)

A number of items that assessed health status were included from the 1995 NHS. These items enabled data from this sample (CU) to be compared to that collected on the Sydney (SYD) and Australian (AUS) population aged 20 to 49 years in the NHS (see Table 13). This age range was chosen as being the closest approximation to the long-term cannabis users in this sample.

Two thirds (67%) of this sample (73% of women and 62% of men) had a long term medical condition - that is, one that had lasted, or was likely to last, for six months or more. Significantly fewer cannabis users had long-term conditions in comparison to the AUS (76%; unadjusted OR=0.61, 95%CI=0.45, 0.83; χ^2=10.9, p=0.001) and SYD (74%; unadjusted OR=0.71, 95%CI=0.52, 0.98; χ^2=4.78, p=0.03) samples interviewed in the NHS. It should be noted that the questions on long-term conditions included in the current study were not directly comparable to those asked in the NHS, as not as many probes for long-term conditions were included, and the wording of the questions were slightly different.

The class of conditions most commonly cited were respiratory. Hayfever was the most frequently experienced condition (36%), followed by asthma (20%), with less than ten

percent experiencing bronchitis (5%), respiratory allergies (5%), sinusitis (3%) or a persistent sore throat or cough (2%). Sixteen percent of the sample had antibodies to hepatitis B or C, while 10% suffered from a psychological condition, most frequently depression or mood disorder (7%). Less than one in ten had experienced other conditions, including: musculoskeletal problems (7%), endocrine or immunity disorders, primarily HIV (5%), disorders of refraction or accommodation of the visual system (5%), migraine (4%) and cancer (3%).

Almost two thirds (61%) of long-term conditions were respiratory, with a greater proportion of women experiencing such symptoms than men (67% vs 56%), although this difference was not significant. The sample were significantly more likely to have respiratory long term conditions than the AUS (42%; unadjusted OR=2.23, 95%CI=1.6, 3.2; χ^2=21.1, p<0.0001) and SYD (37%; unadjusted OR=2.61, 95%CI=1.79, 3.81; χ^2=28.9, p<0.0001) comparison populations .

Very few long-term conditions were caused by an accident (5%), with only one person reporting that cannabis use contributed to their accidental injury. This was a significantly lower proportion than that in the AUS (14%; unadjusted OR=0.35, 95%CI=0.2, 0.8; χ^2=8.2, p=0.004) comparison group. The difference between the cannabis and SYD groups was marginal (SYD=11%; unadjusted OR=0.46, 95%CI=0.18, 1.01; χ^2=3.9, p=0.05).

The National Health Survey also investigated the respiratory symptoms of wheezy or whistly chests. In comparison to the 1989-90 survey, which asked this question only of those not already suffering chronic asthma, bronchitis or emphysema, this 1995 survey asked this question of all participants. Almost three quarters (73%) of the CU sample claimed they had experienced a wheezy or whistly chest when they had not been sick with a cold. Again, this figure is significantly higher than the corresponding AUS (25%; unadjusted OR=7.74, 95%CI=5.61, 10.70; χ^2=229.88, p<0.0001) and SYD (22%; unadjusted OR=9.27, 95%CI=6.62, 13.00; χ^2=242.73, p<0.0001) populations from the NHS. The apparent increased risk of respiratory problems in the sample of long-term cannabis users may be partly attributable to the much greater prevalence of cigarette smoking in this group. While 48% of the SYD sample and 53% of the AUS sample were ex- or current smokers, this was the case for 94% of the cannabis using sample.

There were some differences in rates of health service utilisation between the sample and the comparison populations. A significantly greater proportion of long-term cannabis users had been admitted to a hospital in the previous 12 months (21%) than the 1989-90 comparison populations (SYD: 14%; unadjusted OR=1.63, 95%CI=1.14, 2.33; χ^2=7.45, p=0.006) (AUS: 14%; unadjusted OR=1.54, 95%CI=1.09, 2.18; χ^2=6.18, p=0.01). The 1989-90 data were used as the 1995 survey did not ask this question. Similarly, a doctor or specialist consultation in the previous two weeks was significantly more likely among the CU group compared to both the 1995 SYD (23%; unadjusted OR=1.57, 95%CI=1.14, 2.18; χ^2=8.16, p=0.004) and 1995 AUS (21%; unadjusted OR=1.78, 95%CI=1.31, 2.43; χ^2=14.7, p=0.0001) samples.

Table 13: Comparison of proportions endorsing National Health Survey questions among long-term cannabis users, and the 1995 Sydney and Australia-wide samples interviewed for the NHS.

Variable	Cannabis Study (n=200)	NHS-Sydney (n=2375 adults aged 20-49)	NHS-Australia (n=24781 adults aged 20-49)
Hospitalisation in last 12 months*			
total	20.5	13.6	14.3
women	21.4	19.0	19.5
men	19.8	8.2	9.0
Doctor/specialist consultation in last 2 weeks			
total	31.5	22.6	20.5
women	35.7	27.2	25.1
men	28.4	17.6	15.6
Any long term condition#			
total	66.5	73.6	76.4
women	72.6	79.0	82.3
men	62.1	67.8	70.3
Percent of long term conditions which were respiratory (n=133)			
total	60.9	37.3	41.6
women	67.2	38.2	41.9
men	55.6	36.3	41.2
Long term conditions caused by accident? (n=130)$			
total	5.4	10.9	14.1
women	1.7	7.1	9.1
men	8.5	15.8	20.3
Taking cannabis before accident (n=7)			
total	1 person, male	no data	no data
women			
men			
Wheezy or whistly chest+			
total	72.5	22.1	25.4
women	75.0	21.6	24.3
men	70.7	22.7	26.6

* This question was not asked in the 1995 survey. Estimates are provided from the 1989-90 NHS (Sydney: n=4125; Australia: n=24336).

1995 NHS data on long-term conditions are broadly comparable to the 1989-90 NHS data used as a comparison group with the North Coast sample (Didcott et al, 1997), although caution should be used in making direct comparisons. This is because: (a) additional questions on specific conditions, e.g., diabetes and respiratory conditions were included which may have increased the likelihood of reporting these conditions; (b) additional codes for some conditions have been added e.g., osteoporosis; (c) changes in community attitudes

and perceptions may have affected identification of conditions; (d) account should be taken in the shift in the age profile between the two surveys.
$While the scope of accident data between the 1989-90 and 1995 surveys is similar, modifications such as prompt cards were used in the 1995 survey to explicitly identify certain types of incidents which may have resulted in injury or illness. This was introduced as it was felt that accidents may have been under-reported in the earlier survey.
+ This question asked of all respondents in the 1995 survey.

3.5.2 Psychological health

Just over one third of the sample had consulted a psychologist or other mental health professional at some time in their lives, while 15% had either been admitted to a psychiatric hospital or had been prescibed medication for a psychological condition. The most common such intervention were the prescription of antidepressants (43% of those with conditions) or some other treatment for depression or mood disorder (32%). Fourteen percent of interventions had been for general emotional problems other than depression, with a further 4% specifying treatment for psychoses. Seven percent had received anti-psychotic medication, and 7% had been prescribed benzodiazepines in response to their condition. Forty percent of the sample had seen a psychologist, been hospitalised or been prescribed medication for a psychological problem. There were no gender differences in the likelihood of this occurrence (42% of women vs 38% of men).

Current psychological well-being in the last 7 days was assessed by the SCL-90-R, which presents information on 9 subscales and 3 global indices of functioning. Average raw scores were translated into standardised T-scores calculated for each gender of the normative population of 974 US adult non-patients (Derogatis, 1994). Compared to the normative male population (n=494), male long term users scored more than one standard deviation higher than the mean of the normative population on the anxiety, depression, interpersonal sensitivity, obsessive compulsive, phobic anxiety and psychoticism subscales, as well as the global severity index. Females scored more than one standard deviation higher on the interpersonal sensitivity, obsessive compulsive, and psychoticism subscales, and on the global severity index than the female normative sample (n=480).

The average score on the Global Severity Index, which provides a summary measure of the number and intensity of symptoms of distress, was significantly higher among long term cannabis users than the normative sample (mean of 0.62 vs 0.31; $t_{1169}=10.84$, $p<0.001$). Nonetheless, the profile of scores in this sample of long term cannabis users did not meet Derogatis' (1994) definition of "caseness" or positive risk for psychiatric problems requiring intervention.

3.6 Treatment Issues

Most of this sample (85%) had previously attempted to cut down or cease their cannabis use, with the majority doing so unassisted (90% of those who had decreased/stopped). Those who had reduced their cannabis use gave a variety of reasons for doing so. More than one in five had done so use because they felt they were using too much and were sick of it, or didn't feel like it anymore and needed a break (28%) or for financial reasons (24%). One in five were concerned about their health (20%). Others had reduced their use because they were busy doing other things, or could not use because of their life circumstances (17%), they could not easily obtain cannabis (15%), there were family or relationship issues (13%) or

they had work or study commitments (10%).

Reasons for relapse to use or to increasing levels of use were not surprising. The most common reasons were because they enjoyed it, or felt like using again (34%) and cannabis was available or they had money to buy it (26%). More than ten percent relapsed because it was seen as intrinsic to their lifestyle, or for social reasons, such as associating with other smokers (19%), because their reasons for stopping were no longer relevant (12%) or because of negative moods, including stress, anxiety and insomnia (17%).
Sixteen people had sought assistance to moderate their cannabis use. The most common type of assistance sought was from a drug counsellor, residential service or detox (63% of those who had sought help). One quarter had seen a psychiatrist, while small proportions had seen hypnotherapists, private psychiatric clinics, youth refuges, general practitioners, herbalists or had rung help lines. Approximately half (44%) said their experience had been helpful, 38% said it had not, while 13% said their experiences were variable.

Half (52%) the sample had been questioned about their cannabis use by a health professional, such as a doctor, or had discussed their use with a health professional.

A variety of views were expressed about the need for services to help people who perceived they had a problem with their cannabis use. The most common suggestion was for counselling, or "someone to talk to" (34%). Other suggestions included: support/self-help groups (13%) and Marijuana Anonymous or Narcotics Anonymous (7%), provision of alternative activities (7%), cannabis substitute therapies akin to nicotine patches or methadone maintenance programs (6%), detoxification or residential services (5%), health farms or "new life" programs (4%), and a phone line for advice and support (3%). A further 15% believed services should be provided, but did not know what would be appropriate.

3.7 Correlates of Cannabis Dependence

Demographic and drug use correlates of the 4 measures of severity of cannabis dependence were examined, using Pearson product moment correlation coefficients (see Table 14). In each case the measure of dependence was continuous: the number of criteria met for DSM-III-R and ICD-10 diagnoses, and total score on the UM-CIDI and SDS. In general, correlations were weakest between demographic and drug use variables and the DSM-III-R measure of dependence.

Of the demographic variables, age was most consistently related to all 4 dependence measures. Weak to moderate negative correlations indicated that older respondents met fewer criteria for dependence and had lower dependence scores. Women met significantly more lifetime DSM-III-R dependence criteria than men ($p=0.04$).

Quantity of cannabis use variables was correlated with some dependence measures more than others. Thus, the log of the number of standard cones consumed in the previous month was positively correlated with all dependence measures, although it was most weakly associated with the DSM-III-R measure. Frequency of use had a small but positive correlation with all measures except the DSM-III-R, and was most strongly correlated with the SDS score.

While age of first use was not strongly correlated with dependence, number of years of use

had stronger negative correlations with all measures, indicating lower dependence scores among those who had used for longer. This is consistent with older respondents having lower dependence scores, and in fact the two variables were highly correlated (r=0.9).

Current smoking status and harmfulness of current drinking, as assessed by the AUDIT, were generally unrelated to dependence, although they were most strongly associated with UM-CIDI scores. The number of drug classes or illicit drug classes ever used were also generally unrelated to dependence, except for a weak correlation between number of illicit drugs ever used and number of DSM-III-R criteria met.
Multiple linear regression analyses were conducted using those variables whose correlations with each of the 4 dependence measures had a significance of no more than p=0.1. As age and length of cannabis use were so highly correlated and presented possible collinearity problems, only age was entered into the regression models. Details of these analyses are reported in Appendix A.

The model predicting severity of DSM-III-R dependence ($F_{4,183}$=6.87, p<0.0001) accounted for only a modest percentage (13%) of total variance. Age had a significant negative correlation with severity (β=-0.05, p=0.02), indicating that older respondents met fewer symptoms of lifetime dependence. Women were significantly more likely than men to have more dependence symptoms (β=-0.80, p=0.01), despite having used for significantly fewer years. Quantity of cannabis used in the previous month was also positively correlated with severity (β=0.94, p=0.02), as was the score on the AUDIT (β=0.05, p=0.02), suggesting co-morbidity between alcohol and cannabis problems.

Severity of an ICD-10 diagnosis was predicted by age and the log of standard cones consumed ($F_{2,194}$=21.34, p<0.0001) and accounted for 17% of the variance. As for the DSM-III-R dependence measure, age was negatively correlated with number of ICD-10 criteria experienced in the last year (β=-0.06, p<0.0001), while quantity used in the last month was positively associated with severity (β=0.37, p<0.0001).

The model predicting severity of UM-CIDI dependence accounted for one third (32%) of the variance in outcome. Again , age was negatively associated with UM-CIDI score (β=-0.09, p<0.0001), while the remaining variables were positively associated with outcome. Thus, the greater the log of cones consumed per day (β=0.56, p<0.0001) and the greater the score indicating harmful alcohol consumption (β=0.05, p=0.01), the higher the score on the UM-CIDI.

Finally, the model predicting severity of SDS dependence ($F_{2,196}$=16.48, p<0.0001) also accounted for only a modest proportion of the total variance. Age remained negatively correlated with SDS score (β=-0.06, p=0.04), suggesting that older respondents were less concerned about their use in the last year. The log of quantity consumed in the past month was positively associated with SDS scores (β=0.85, p<0.0001), indicating that the more a respondent consumed, the more their concern over their cannabis use.

Table 14: Correlates of severity of cannabis dependence (Pearson correlation coefficients).

	DSM-III-R	ICD-10	UM-CIDI	SDS
Age	-0.23	-0.30	-0.38	-0.18
Gender	-0.15	-0.06*	-0.06*	-0.11*
Quantity of cannabis +	0.15	0.33	0.40	0.35
Frequency of use	0.08*	0.19	0.18	0.25
Age at first cannabis use	-0.14	-0.11*	-0.20	-0.04*
Years of cannabis use	-0.19	-0.29	-0.34	-0.18
Current smoker	0.08*	0.03*	0.13	0.003*
AUDIT score	0.14	0.12	0.17	0.002*
N of drugs ever used	0.09*	0.005*	-0.02*	-0.02*
N of illicit drugs ever used	0.12	0.05*	0.03*	-0.002*

*p>0.1

+ Quantity=log of number of "standard" cones used in the past month

3.7.1 Correlates of self-perceived problematic use

Analyses were conducted to investigate the characteristics that predicted whether someone thought that their cannabis use was a problem. While the majority of the sample were diagnosed with DSM-III-R and ICD-10 dependence, only 39% were classified as dependent by the SDS, and only 37% thought they had a cannabis problem, at least sometimes. A limited number of demographic and cannabis use variables were tested as predictors: age, gender, quantity and frequency of use and all 4 dependence measures.

Univariate analyses showed a strong relationship between both severity of dependence (taken as number of criteria met or dependence score) and receiving a dependence diagnosis, and the belief that cannabis use was a problem. For each dependence measure, those reporting a problem had significantly higher dependence scores than those who did not. This is also reflected in the unadjusted odds ratios for the odds of reporting a cannabis problem when receiving each of the four dependence diagnoses (Table 15). While age and gender were not associated with self-perceived problems, there was a significant trend toward greater recognition of problems among more frequent users (χ^2_{MH}, 1df=10.6, p=0.001). Those who reported a problem also consumed a greater quantity of cannabis in the last month (as measured by the log of the number of standard cones) (mean log of 1.98 vs 1.15 standard cones per day; t_{178}=-4.87, p<0.0001).

Four multivariate analyses were conducted to predict self-reported problem use from frequency and quantity of use, and whether or not a dependence diagnosis was made on each

of the four scales. Age and gender were omitted from these analyses as they were not significantly associated with self-reported problem use ($p>0.1$).

For three of the four analyses, problem cannabis use was predicted by a combination of current quantity of cannabis used and a cannabis dependence diagnosis. Thus, for the DSM-III-R (β=-1.15), ICD-10 (β=-0.81) and UM-CIDI (β=0.93) measures, those with a dependence diagnosis were significantly more likely than those without to believe they had a cannabis problem. In addition, the more they consumed (in terms of the log of standard cones consumed per day in the last month), the more likely they were to be worried about use (DSM-III-R: β=0.61; ICD-10: β=0.52; UM-CIDI: β=0.44). In the fourth analysis, only an SDS dependence diagnosis predicted problematic use (β=-1.38, χ^2=69.3, 1df, $p<0.0001$). This is not surprising, as the SDS basically measures concern about use.

Table 15: Unadjusted and adjusted odds ratios for a dependence diagnosis as a predictor of self-reported cannabis problem

	% reporting problematic use	unadjusted OR (95% CI)	adjusted OR[+]
DSM-III-R dependent	41	10.5[*] (1.4-81.2)	9.9
ICD-10 dependent	49	6.7[*] (2.8-15.8)	5.0
UM-CIDI dependent	44	3.7[*] (1.6-8.4)	2.5
SDS dependent	74	15.9[*] (7.7-32.8)	15.9

[*]Reference category are those not classified as dependent

[+] Adjusted for: frequency and quantity of use, presence/absence of dependence

3.8 Dependence and psychological health

The relationship was assessed between dependence scores on each of the four dependence measures, quantity of cannabis used in the last month, number of drug classes (excluding cannabis) used in the last month and score on the Global Severity Index (GSI) of the SCL 90-R.

There were weak to moderate positive correlations between dependence scores on all four measures and the total score on the GSI (see Table 16). While there was no statistically significant relationship between the amount of cannabis consumed in the last month (the log

of the number of "standard" cones per day) and GSI, there was a small statistically significant association between the number of drugs used in the last month and psychological well-being. Thus, the greater the number of dependence criteria met and drug classes used, the more likely respondents were to have higher levels of psychological distress.

Four multiple linear regressions, containing the variables measuring each of the four cannabis dependence scores and polydrug use in the last month, were conducted in order to predict the total GSI score. In each case, cannabis dependence and number of drugs used significantly predicted psychological distress, although the models did not account for a great deal of the variance in GSI scores (range of 16% for the UM-CIDI to 25% for ICD-10). It should be noted that while analysis of the residuals provided little evidence for deviation from the assumptions of linear regression, normal probability plots of the standardised residuals for each analysis were slightly deviant from normal.

Table 16: Correlates of psychological distress, as measured on the Global Severity Index (Pearson product moment correlations).

	GSI Score
Number of DSM-III-R criteria	0.43
Number of ICD-10 criteria	0.47
Score on UM-CIDI	0.37
Score on SDS	0.39
Log N of "standard" cones consumed	0.11*
Number of drugs used	0.23

* $p>0.1$

3.9 Agreement between Dependence Measures

Two measures of the agreement between each of the dependence scales were calculated: Pearson correlations between the total scores on each instrument, and Cohen's kappas to indicate the agreement between dichotomous dependence diagnoses (diagnosis present versus absent).

3.9.1 Correlations between scores

Pearson product moment correlations between the number of lifetime DSM-IV and DSM-III-R criteria met on the CIDI-SAM were high (0.96). Correlations between the number of lifetime DSM-III-R criteria and the scores on the three comparison scales were moderate to good. The highest correlation (0.64) existed between the number of criteria met on the CIDI and the number of ICD-10 criteria met on the Ontario Adult Drug Use Questionnaire. The next highest correlation (0.63) lay between the CIDI and the score on the UM-CIDI, while the total SDS had the lowest correlation (0.57).

Intercorrelations between the remaining three instruments were of the same order as those above. Thus, the highest correlation was between the Ontario questionnaire and the UM-CIDI (0.70), followed by that between the Ontario questionnaire and the SDS (0.61), and finally the UM-CIDI and the SDS (0.56).

3.9.2 Agreement among dependence diagnoses

There was generally poor agreement between the "gold standard" DSM-III-R diagnosis and the 3 comparison scales in terms of the proportions identified as dependent. This is reflected in the kappas for agreement between a DSM-III-R lifetime diagnosis of dependence (CIDI-SAM) and a diagnosis in the last year from the short UM-CIDI (kappa=0.30), the ICD-10 criteria (kappa=0.28), and the SDS (kappa=0.07). The kappas only slightly improved when agreement was assessed for those whose last dependence symptom had occurred in the last year. This lack of difference is not surprising, given the majority of the sample experienced a DSM-III-R dependence symptom in the last year.

Agreement between a dependence diagnosis on the ICD-10 and UM-CIDI (kappa=0.60), the ICD-10 and SDS (kappa=0.29) and the UM-CIDI and the SDS (kappa=0.21) was variable. The relatively good agreement between the ICD-10 and UM-CIDI instruments is not surprising as they are measuring similar aspects of use. The disagreement between these instruments and the SDS, which is more narrowly focused on the psychological construct of loss of control and concern over use, is also not surprising. Indeed, the SDS was most in agreement with respondents' beliefs as to whether they had a cannabis problem (kappa=0.59). Agreement between a self-diagnosed problem and the DSM-III-R (kappa=0.09), ICD-10 (kappa=0.28) and UM-CIDI (kappa=0.17) diagnoses was poor.

Extent of agreement between diagnoses was also examined using the modified dependence cut-off scores calculated from the ROC analyses (see Section 3.10). Agreement between a lifetime DSM-III-R diagnosis of dependence and a diagnosis on all three comparison instruments remained poor. However, it was markedly worse after adjusting the cut-offs of the ICD-10 (kappa=0.19) and UM-CIDI (kappa=0.15), although it improved slightly for the SDS (kappa=0.12). Again, when the time periods were made comparable (i.e., all instruments referred to dependence in the last 12 months), the kappas showed only a slight improvement.

The extent of agreement regarding a dependence diagnosis for the 3 comparison instruments after using the modified cut-offs changed, with all three producing similar kappas (ICD-10 vs UM-CIDI: kappa=0.50; ICD-10 vs SDS: kappa=0.46; UM-CIDI vs SDS: kappa=0.46).

3.10 Receiver Operating Characteristic (ROC) Analyses

ROC analyses were performed on the Ontario Adult Drug Use Questionnaire, the UM-CIDI and the SDS to estimate the most appropriate cut-off point for a diagnosis of dependence on each of these instruments in this population. These analyses were used to select the optimum cut-off point in discriminating between a "case" (dependent) and a "control" (non-dependent) by testing their performance against the "gold standard" measure of dependence, a DSM-III-R diagnosis of dependence obtained from the CIDI-SAM.

As there was some concern over the potential for the CIDI-SAM to over-diagnose dependence, two sets of ROC analyses were performed for each instrument. The first defined a "case" as those with a diagnosis of severe dependence in the last year (n=78; 39% of the sample), and a "control" as all other respondents. The second defined a "case" as those with at least moderate dependence in the last year (n=138; 69% of the sample), and a "control" as all other respondents. Given the relationship between severity of dependence and self-reported problematic use (see Section 3.7) it was felt that including those with mild

dependence as "cases" of dependence would overestimate those who were likely to be experiencing the most problematic use. They were accordingly included as "controls" in both sets of analyses. The time period of the last 12 months was chosen as this is the time period assessed in each of the other three instruments.

Details of the analysis are reported in Appendix B, while the results are presented in Table 17.

Table 17: Original and amended cut-offs for a cannabis dependence diagnosis

Dependence Measure	Original Cut-off	Amended Cut-off	Original/Amended Dependence (%)
ICD-10 (Ontario Questionnaire)	at least 3	at least 3	72/72
UM-CIDI	at least 3	at least 3	77/77
SDS	at least 5*	at least 3	39/62

* This cut-off developed among stimulant users (Hando and Hall, 1994; Topp and Mattick, 1997).

For two out of three of the instruments, the ROC analyses produced the same cut-offs as those conventionally applied. There was no difference in the amended cut-off when the two definitions of a "case" were employed.

For the Ontario Drug Use Questionnaire (ICD-10) a value of 3 represented the best trade-off in terms of sensitivity and specificity, in discriminating those with and without cannabis dependence. The similarity in the results of the two analyses suggests that in this population the Ontario questionnaire discriminates equally well between those with and without severe cannabis dependence and those with and without at least moderate cannabis dependence.

For the UM-CIDI, a cut-off of 3 was also optimal, and again this is unchanged from the comventional diagnostic cut-off. As for the Ontario questionnaire, there was little difference in the UM-CIDI's ability to discriminate between the presence or absence of dependence using the two definitions of a "case".

For both these instruments it is surprising that a more conservative cut-off was not found, as they were originally developed for use in population-based surveys.

The SDS produced a more liberal cut-off than originally developed for injecting drug users. A cut-off of 3 (χ^2=40.3) remained the optimal cut-off in this population of long term cannabis users for both definitions of a "case". This scale was originally developed among opiate, cocaine and amphetamine users and was designed to measure compulsion to use. Thus, a relative lack of such a compulsion to use among cannabis users may contribute to the relaxed cut-off for a dependence diagnosis.
After amending the cut-offs, the proportion receiving an SDS dependence diagnosis markedly increased, and was more comparable to the ICD-10 and UM-CIDI measures.

3.11 Testing the Unidimensionality Hypothesis of the Dependence Syndrome

The proposed underlying unidimensionality of the dependence syndrome was examined in this population among the four instruments used to measure dependence: the CIDI-SAM, the Ontario Adult Drug Use Questionnaire, the UM-CIDI and the SDS. A Principal Components Analysis (PCA) was performed on each instrument to identify the linear combination of dependence criteria that would explain the maximum amount of variance in the data. Cronbach's alpha was also determined to measure the internal consistency of each measure of dependence. If these are unidimensional scales the value of alpha should be 0.70 or greater (Streiner & Norman, 1995). Details of these analyses are reported in Appendix C.

The only scale providing evidence for a unidimensional cannabis dependence syndrome was the SDS. This instrument demonstrated a high level of internal consistency, its first PC accounted for nearly two thirds of the total variance, and all items loaded positively on it. These findings were comparable to those in a sample of long term cannabis users on the NSW North Coast (Didcott et al., 1997), and to other populations of drug users (e.g., Gossop et al., 1995; Swift et al., 1997; Topp et al., 1995). The good psychometric properties of the scale are perhaps not surprising, given that the scale limits itself to measuring concern about impaired control of cannabis use.

The PCA of all other scales produced at least two factor solutions. The only meaningful structure was produced by the short UM-CIDI, which separated use despite psychological problems, tolerance and inability to resist using or limit using, from use in inappropriate or dangerous situations, which may not be of sufficient severity to indicate dependence. Interestingly, the PCAs on these scales also produced a number of large negative loadings on the components.

The lack of support for unidimensionality in these analyses was similar to that observed among the sample on the NSW North Coast (Swift et al, submitted), with only the SDS producing a meaningful unidimensional structure, and high negative loadings on principal components.

CHAPTER 4

DISCUSSION

4.1 Patterns of Cannabis Use

This study succeeded in recruiting a group of long-term cannabis users, who had been regularly using cannabis for an average of 10 years. Men had been using on average longer than women, although this may simply reflect the stricter entry criterion for males in the study. Three quarters of the sample (74%) used at least four times a week, with just over half (56%) being daily users. Half (51%) had been using at current levels for at least five years. As expected from differences in entry criteria, this sample had not been using as long as, and there was more variation in patterns of use, than found among long term cannabis users on the NSW North Coast (Didcott et al, 1997).

Given the average age of this sample was 28 years, it is interesting to speculate how many will continue their current regular use patterns. Cannabis use is typically discontinued in the late 20s (Kandel and Davies, 1992; Kandel and Logan, 1984). It is possible that some in this sample may not maintain their use pattern over the following decades as did long term cannabis users in the North Coast study. It seems more likely that some will stop since 36% of the sample intended to moderate their cannabis use in the following 12 months. Whether this was intended as a short term break from cannabis or a more enduring change is open to speculation. Further light may be shed on this issue when the sample are reinterviewed in one year. Nevertheless, as with the North Coast sample, the regular users in this study were more likely than their age peers to have begun cannabis use early, to smoke cigarettes, and to have used several illicit drugs (Donnelly and Hall, 1994).

As with the North Coast respondents, cannabis was used in much the same way as alcohol, particularly to relieve stress and aid in relaxation, without the perceived antisocial effects produced by drinking.

There were some interesting differences in the contexts of use of this sample compared to the North Coast sample. While joints were more frequently smoked on the North Coast, bongs or waterpipes were almost exclusively used in Sydney. Likewise, people in Sydney were much more likely to smoke the flowering heads of the plant. These differences may be partly accounted for by greater availability of cannabis on the NSW North Coast. In Sydney, the cannabis supply was less reliable, fewer people grew their own cannabis plants and the price of cannabis was more variable. By smoking heads in a bong, the maximum effect from a more limited and expensive supply could be achieved. Tobacco was frequently added to the cannabis, which may also have made the supply last longer. Nevertheless, most respondents (80%) found cannabis easy or very easy to obtain.

Cannabis use in the North Coast sample was also more likely to occur in social settings, with only 12% usually smoking alone. Cannabis also seemed to be a much more integral part of daily activities, with 61% often smoking during their daily tasks, including work. Potential social differences between the samples may partly mediate these findings. The Sydney sample may have contained a greater range of respondents that was more representative of

residents of a major city, whereas the more tolerant attitudes in a rural area in which cannabis use is widely sanctioned may have encouraged potentially heavier cannabis use.

4.2 Patterns of Other Drug Use

As with the North Coast sample, polydrug use was common. The major difference was that a greater proportion of this younger sample had previously used, and were currently using, other drugs, including alcohol and other illicit drugs, and more had experienced problems with the use of drugs other than cannabis.

The majority of the sample were former or current smokers and were regular alcohol consumers. A large proportion of drinkers were consuming alcohol at hazardous or harmful levels, although many were not concerned about their alcohol use. The AUDIT scores in this group were higher than those identified in a Sydney sample of emergency department patients, and are also higher than other general population samples (e.g., see Didcott et al, 1997). Interestingly, almost half the sample (47%) had a history of drug problems other than cannabis, with 20% having sought help with this problem. Alcohol and amphetamine were the most frequently reported problematic drugs (both 27%).

These data are consistent with much of the literature on cannabis use, which fails to support the concept of the "pure" cannabis user. Only two people had regularly used cannabis only, and only 5% were currently using cannabis alone. The majority were also using tobacco and alcohol.

Cannabis was frequently used in combination with other drugs, either to moderate the "high", or as an aid in "coming down". Nevertheless, the combination of cannabis and alcohol was frequently described as aversive, resulting in nausea and blackouts. Research has highlighted the complex nature of the interaction between the drugs and their combined effects on performance, heart rate and mood, although the effect on performance appears to be additive (Chesher, 1986). These findings suggest the need for providing information about the potential harms from combining cannabis and alcohol, especially those connected with driving a motor vehicle.

4.3 Cannabis Dependence

4.3.1 Prevalence and Correlates of Dependence

The majority of this sample qualified for a lifetime DSM-III-R diagnosis of cannabis dependence, and 40% met criteria for severe cannabis dependence. Almost three quarters (74%) received a lifetime DSM-IV dependence diagnosis. Dependence diagnoses for the last 12 months were only slightly less prevalent, with 77% receiving a DSM-III-R diagnosis on the UM-CIDI, and 72% an ICD-10 diagnosis. The only dependence measure that showed a much lower prevalence was the SDS, which diagnosed 39% of the sample as cannabis dependent in the last year. In general, greater proportions of the Sydney sample than the North Coast qualified for the dependence diagnoses which were common between the studies. As there is little research using these dependence measures among such chronic users, it is difficult to ascertain how these data compare to other populations of long-term users. However, these prevalence figures certainly confirm previous estimates of a substantial risk of dependence among regular cannabis users.

There were differences between measures in the prevalence of different dependence symptoms. When considering DSM-III-R criteria, the most prevalent criterion was continuing to use cannabis despite knowledge of problems caused by its use, and the least frequent was neglecting other activities in favour of cannabis. Among the North Coast sample, the most frequently endorsed criterion was intoxication during daily activities, while withdrawal symptoms were only experienced by 6% of the sample. Some of these differences may partly reflect differences in the wording of the questions in the two studies. However, it is possible that the much greater prevalence of withdrawal symptoms among the Sydney sample may reflect the less certain availability of cannabis in Sydney. Tolerance and withdrawal symptoms were more common among the Sydney users.

Severity of dependence was correlated with a number of demographic and drug use variables. The most consistent relationship was between age, quantity of cannabis used and dependence severity. Older users were less severely dependent than younger users, largely because they had begun using later than their younger peers. There is support for some of these findings from the North Coast sample and recent population studies (Chen, Kandel and Davies, 1997). Further, Kandel and colleagues (1986) found that those who began drug use earlier were at greater risk of continued use, and thus may arguably be at greater risk of developing dependence. However, in general, there is little evidence for consistent patterns in the correlates of dependence in long-term using populations, largely because of lack of research on this group.

Gender was related to two of the cannabis dependence measures. In this sample DSM-III-R dependence was more common among females than males, despite their shorter history of cannabis use. This finding is consistent with studies on alcohol and opiate dependence, which have found a "telescoping" of dependence among women (Hasin et al, 1988b; Hser et al, 1987; Mulford, 1977). Such a phenomenon sees a more rapid development of dependence problems in women than men. It is also consistent with data from the 1992 National Longitudinal Alcohol Epidemiologic Survey (Grant, 1996), based on a national probability sample of 42682 US adults. This study found that rates of DSM-IV dependence among female drug users in the younger birth cohorts, were either greater than or approaching those of men. The greatest effect was for those aged 25-34 years, the age group that included most of the women in this research.

Consistent with the growing body of literature on the comorbidity between dependence disorders (Hall, 1996; Kessler, 1995), AUDIT scores in this sample were associated with DSM-III-R diagnoses (as measured by the CIDI-SAM and the UM-CIDI). While the AUDIT does not produce a dependence diagnosis, as an indicator of hazardous or harmful drinking patterns it could be considered an indicator of potential dependence. Thus, the greater the alcohol-related harm, the greater the number of dependence symptoms experienced by an individual. The relationship between cannabis and alcohol problems may have implications for screening for problematic AOD use in general. Instead of concentrating on a presenting AOD problem, clinicians may need to be aware of the potential for concurrent problematic use of other drugs. This also has implications for the assessment of competing priorities in providing an intervention, and the type and timing of intervention required.

As with the North Coast study, there was a major discrepancy between receiving a

DSM-III-R or ICD-10 diagnosis and being diagnosed as dependent by the SDS. People's beliefs about whether they had a problem with cannabis were in greater agreement with the SDS than the other dependence measures. This was reflected in the poor agreement between the SDS and the other dependence measures.

It is interesting to speculate on the reasons for differences in the prevalence of cannabis dependence between the current sample and the previous study of long term cannabis users on the NSW North Coast. Although the North Coast sample had a longer history of cannabis use and more intensive patterns of cannabis use, they were less likely to receive a dependence diagnosis and less likely than their Sydney peers to believe they had a cannabis problem. This may partly reflect differences in the way in which dependence was assessed in the two studies. DSM-III-R and ICD-10 diagnoses, for example, were approximated in the North Coast study. However, it is also likely that these are real differences that reflect differences in the cannabis using cultures of the two regions.

The concept of "wet" and "dry" cultures has been used in the alcohol literature (Pittman, 1967; Room et al, 1996). Room and colleagues (1996), in a report on the cross-cultural applicability of substance use diagnoses, describe a "wet" alcohol culture as follows: "in the ideal type of a wet culture nearly everybody drinks nearly every day; alcohol is a domesticated and indeed banalized part of daily life. Heavy drinking is thus an extension of social drinking; the norm for the heavy drinker, indeed, is to keep drunken behaviour as much like sober behaviour as possible" (p.204). In contrast, at the "drier" end of the continuum alcohol is separate from daily life, and there are many abstainers. "Drinking is 'time out' behaviour, and drunkenness can serve as an explanation of bad behaviour" (p.204).

It is possible to conceptualise the North Coast sample, where cannabis use is widely sanctioned and integral to daily life, as a relatively "wet" cannabis culture. Sydney users, on the other hand, may be more representative of the general population, and perhaps more sensitive to the general view of cannabis use held by the wider population. Thus, in a more diverse population where cannabis users interact more with non-users, the wider society's norms relating to drug use may be absorbed. This may produce a "drier" cannabis using culture, where users are more willing to admit to certain patterns of behaviour which constitute the dependence diagnosis, and more likely to interpret certain behaviours as problematic. Further, lifestyle differences reflected in such things as job type and performance expectations, may also play a role. While this does not explain the discrepancy between a dependence diagnosis and a self-reported cannabis problem, a greater proportion of the Sydney population rated their use as at least sometimes problematic (37% vs 26% of the North Coast sample).

One must also consider whether a dependence diagnosis, in and of itself, is indicative of a problem with use. Certainly, various items in the dependence measures revealed that people were using cannabis in potentially damaging ways, and had continued to use despite experiencing adverse consequences. But respondents' assessments of the place of cannabis in their lives did not always coincide with these experiences. When asked to weigh up the pros and cons of recent use, 43% believed cannabis had done them more good than harm, while only 13% believed harm outweighed the good. One third (35%) believed harm and good were equal. This is also reflected in the satisfaction many cannabis users felt with their current use patterns, with 58% having no intention of cutting down or quitting in the near

future.

As Didcott and colleagues (1997) argue, some users may reject the concept of dependence as measured by these instruments (also see Section 4.3.3 for a discussion of measurement issues), while others may argue that the personal costs of dependence are not serious and they could discontinue their use if they chose to. The majority had modified their cannabis use at some time in the past, but nearly half had reported unsuccessful efforts at doing so. This tension between qualifying for a dependence diagnosis and its consequences is consistent with Edwards and colleagues' (1984) assertion that dependence need not be a disability. Nevertheless, it is important not to dismiss the importance of cannabis dependence, as the more symptoms of dependence that were met, the more likely the person was to believe that they had a problem with cannabis. The one year follow-up should also provide limited information on the extent to which dependence may predict future problematic use patterns.

4.3.2 Unidimensionality of Cannabis Dependence

Apart from the SDS, which demonstrated unidimensionality, there was little evidence that symptoms of cannabis dependence in this population comprised a single, underlying dimension. This is consistent with the data reported on the North Coast sample (Swift et al, submitted), although the detailed patterns of results differed between the North Coast and Sydney samples.

It is difficult to directly compare these results with those in the existing literature since our sample is unlike others previously reported. The majority of previous studies have been in samples of persons seeking treatment among whom cannabis was not the principal drug of dependence. Despite differing measures of dependence and different methods of statistical analysis it is possible to discern some similarities and differences.

Firstly, as with some other studies (Kosten et al, 1987), there is evidence that at least some of the UM-CIDI dependence criteria load on a factor which could be described as indicative of compulsive use. But this was not replicated in any consistent way with the CIDI-SAM or the ICD-10 criteria. Secondly, some previous research has reported a separation of behavioural and physiological criteria (Hasin et al, 1988a; Kosten et al, 1987). In this sample, however, tolerance and withdrawal did not consistently load together. Nor were they consistently separated from the behavioural items among the DSM-III-R and ICD-10 criteria. Thus, unlike the dependence syndromes for opiates and alcohol, symptoms of tolerance and withdrawal for cannabis do not load neatly with other items in the syndrome. Finally, previous research has not reported the high negative loadings found on PCs in this sample.

These results need to be replicated in other populations of long-term cannabis users. Specifically, the robustness of our findings need to be evaluated in other cannabis-using populations, and particularly in samples of cannabis users seeking assistance to cease their use.

4.3.3 Measurement Issues

This research raises a number of issues about the measurement of cannabis dependence, and the implications this may have for clinical diagnosis and research on cannabis dependence in different settings.

The four dependence measures used in this study differed in a number of respects. Perhaps the most obvious difference lies between the SDS and the three DSM-III-R and ICD-10 measures. The SDS is a brief instrument that was originally developed for use among opiate and stimulant users. It assesses a relatively limited concept of dependence which centres on the user's concern about control over their drug use. The other measures operationalise the DSM-III-R and ICD-10 dependence criteria, in a more or less concise form. Thus, the CIDI-SAM is a complex and lengthy instrument that requires WHO accreditation to use. This interview (or a shorter version, the CIDI-Core) is often considered to be the "gold standard" for diagnostic interviews. The short form of the UM-CIDI was developed to provide a simpler, shorter version for use in epidemiological research where complex and lengthy interviews were not feasible. The Ontario Drug Use Questionnaire similarly attempts to address the ICD-10 criteria in a straightforward, compact format for use in population surveys.

Some of these differences in origins and aims readily explain the patterns and extent of disagreement between the measures. Most obviously, there was poor agreement between the SDS and the remaining measures, while the SDS was most closely related to a perception of problem use. However, the three remaining measures were not always highly correlated. Reassuringly, there was good agreement between a DSM-III-R and a DSM-IV dependence diagnosis. Nevertheless, while correlations between the number of criteria met on the two DSM-III-R and the ICD-10 measures were generally at least moderate, agreement between the presence or absence of a dependence diagnosis was poor. This was not rectified by assessing agreement among all three instruments during the last year.

It was also of interest that agreement between the dependence measures was worse rather than better after using adjusted cut-offs for a diagnosis based upon ROC analyses. This is despite the fact that the prevalence of dependence among all measures but the CIDI-SAM was very similar after applying the new cut-offs. There is generally good evidence that the ICD and DSM classification systems are in good agreement for making a dependence diagnosis for many drugs, but there has been less agreement for cannabis than other drugs (Cottler, 1993; Rapaport et al, 1993; Rounsaville et al, 1993). Nevertheless, the agreement between severity of dependence on the CIDI-SAM and the short UM-CIDI suggests that the latter instrument may be used in some circumstances as a simpler alternative to the lengthy CIDI-SAM in arriving at a DSM-III-R diagnosis of cannabis dependence.

It is possible that some of the discrepancies between this study and the existing literature may result from the variety of samples on which the instruments were developed and validated. Differences in format may also affect the level of agreement. For example, changes in the wording used in the short form of the UM-CIDI may have an impact on its comparability to the parent CIDI-SAM. It is possible that self-administration of the ICD-10 measure and the SDS in this study may have also affected comprehension of the questions, although the interviewer explained any problematic concepts.

Another issue is the cut-off score at which a dependence diagnosis is made. The ROC analyses suggested that the ICD-10 and UM-CIDI measures are relatively robust in terms of their ability to diagnose dependence in different populations. This is surprising, as use patterns were far heavier in this group than in the populations on which these instruments were developed. Conversely, a more liberal cut-off should be applied to the SDS. As

speculated earlier, this may be because compulsive use patterns are less common among heavy cannabis users than their opiate, cocaine and amphetamine using peers. Thus, it is possible that both over- and under-estimation of dependence may result if inappropriate diagnostic levels are used. Indeed, after using adjusted criteria for dependence, the overall proportion identified as dependent was more consistent even while the agreement in who was diagnosed as dependent declined. Further research with other populations of long-term users is essential in order to determine the most appropriate diagnostic cut-offs. At this stage, it would be wise to use the cut-offs identified in this sample with long-term cannabis users.

Consideration should also be given to the potential for over-diagnosis by the CIDI-SAM. A dependence diagnosis was derived for 92% of this sample, yet it is not clear how clinically meaningful this may be. While the ROC analyses use the CIDI-SAM as a 'gold standard" against which to determine the appropriate cut-offs for other dependence instruments, there has been no cut-off determined for this instrument in a population of heavy cannabis users. In populations with heavy and chronic cannabis use, a dependence diagnosis may be relatively easy to achieve. It may be that a diagnosis of mild dependence has little clinical relevance in this population compared to the general population, in which the rate of heavy use is much lower. Indeed, as there was a significant relationship between severity of dependence and self-reported problematic use, it may be that moderate or more severe levels of dependence have clinical relevance. This needs to be further investigated by assessing the sensitivity and specificity of DSM-III-R and DSM-IV diagnosis obtained with this instrument against a psychiatric interview. It may also be assisted by examining associations between patterns of cannabis use, adverse consequences of such use, and treatment outcome. There is little existing research addressing this issue with cannabis (see Langenbucher et al, 1995), largely because long-term users have not been systematically studied with standardised measures of dependence.

Another issue relates to the common practice within many diagnostic systems of using the age of onset of the first dependence symptom and the recency of the last symptom, as proxies for age of onset and recency of a dependence diagnosis. As described earlier, these practices overestimate the chronicity of the disorder, although it probably does not affect the validity of the diagnosis *per se*. This convention has rarely been addressed or challenged (but see Kessler et al, 1996 for an exception). It has implications for the comparability of research which has used different conventions for calculating onset and recency of dependence symptoms. It may also affect our understanding of the natural history of cannabis dependence.

Finally, the utility of these measures may differ depending on the setting in which they are used. The SDS may have clinical utility in treatment and general health settings where concern over use is of primary interest. It has the advantages that it is brief and easy to understand and administer, and it is most closely associated with a person's belief that their cannabis use is a problem. In epidemiological research in general population settings, or when screening in generalist health context, where time is limited, the shorter ICD-10 and UM-CIDI may be the most economical measures of the dependence syndrome. The CIDI-SAM may be most appropriate for use to settings where workers are trained in its administration, and there is time to explain concepts if required, such as, in a diagnostic assessment.

4.4 Health Effects

Most of this sample recognised both the potential benefits and harms to health from cannabis use. They were more likely than a general population sample to identify benefits from cannabis use but they were also more likely to identify harms, probably because of their increased familiarity with the drug's effects. The main benefits identified were reduced stress and generally positive psychological effects. These were offset primarily by the perceived negative respiratory effects of use, with a substantial minority also aware of negative psychological effects. The major respiratory concern was the general negative effects of cannabis on the lungs, frequent coughing and the enhanced potential for developing bronchitis and cancer. Many were more concerned about the predominance of smoking as the route of use, or with the addition of tobacco to the cannabis. These concerns were tentatively borne out by the NHS data which showed that this group had higher unadjusted rates of respiratory long-term conditions and wheezy or whistly chests than the Sydney and Australian comparison groups interviewed in the 1995 NHS. The finding of an excess of wheezy or whistly chests is consistent with that of the North Coast sample, although they had a lower rate of long-term respiratory conditions than the general population. Tashkin and colleagues (1990, 1993) have also reported increased rates of certain respiratory symptoms in longitudinal research on cohorts of long-term cannabis smokers.

Caution must be exercised in attributing these findings solely to cannabis use. Given the greater proportion of smokers among the Sydney sample than the general population, it is impossible to separate the effects of tobacco smoking from those of cannabis smoking in producing respiratory symptoms. The lack of detail on the tobacco smoking history of the Sydney sample in particular, and the low proportion of non-smokers, does not make it feasible to examine the potential contribution of tobacco to these findings. Further, differences in the wording of questions in all three studies may confound real differences in the prevalence of such conditions.

Unlike the North Coast sample, the Sydney sample were less likely than the NHS comparison groups to have experienced long-term conditions as a result of an accident. In this case, the role of alcohol must be considered as a potential contributory factor.

Nevertheless, Didcott and colleagues (1997) suggest

> "that we should beware of drawing reassuring conclusions from the interpretive problems posed by the confounding between cannabis and alcohol and tobacco use. The fact that these health effects cannot be unambiguously attributed to cannabis use alone does not mean that cannabis use can be exculpated as a cause of respiratory symptoms or accidental injury. The fact that most cannabis users also smoke tobacco and that many...also use alcohol means that the relevant research questions are more properly formulated as follows: To what extent does chronic heavy cannabis smoking exacerbate the respiratory damage caused by cigarette smoking? To what extent does concurrent cannabis and alcohol use increase the risk of accidents when someone drives or uses machinery after using these drugs?" (pp.69-70).

Further, although this sample showed elevation on certain subscales of the measure of

psychological well-being when compared to the normative population, there was no indication that SCL-90-R scores indicated a clinical profile of psychological distress. Nevertheless, cannabis dependence and polydrug use were related to well-being. The more symptoms of dependence met and the more drugs currently used, the greater the SCL-90-R score. While the relationship between dependence and SCL-90-R scores is consistent with the North Coast data, there is a need for further research into the relationship between patterns of cannabis use and well-being among long-term users.

Finally, 40% of this sample had consulted a mental health professional, been admitted to a psychiatric hospital or prescribed medication for a psychological problem. While this figure may seem to be high, there is no comparative Australian data available, so caution must be exercised in evaluating its significance. Weller and Halikas (1985) found high levels of psychological problems in their sample of 97 long-term cannabis users. However, as they note, it is possible that although respondents were not recruited through treatment sources, the sample was biased in attracting those those who had experienced psychological problems at some stage in their life (see also Section 4.6.1).

4.5 Treatment Issues

The majority of this sample had moderated their cannabis use at some time, and 77% had done so without professional assistance. Reasons for moderating use and subsequent relapse were consistent with the literature on other drugs. Thus, concerns over frequency of use, and health, work, family and financial issues can be powerful motivators for change. Nevertheless, relapse was common, being mediated by such factors as enjoyment, availability, social context and stress.

Few people (8%) had sought assistance to moderate their cannabis use from specialist alcohol and other drug services. This may be because few thought that services were appropriate or necessary, yet a large proportion of the sample believed a variety of treatment services should be provided to those who require them. It is possible that services for cannabis use were unknown or not widely available, especially if help was sought some time ago. There has been a perception among users and clinicians that cannabis is a "different" drug, that either does not require intervention or is somehow more difficult to treat than other drugs. This is borne out by that nine percent of this sample who believed services were not required, as it was up to the individual to solve their problems, or that cannabis was not a problematic drug. Yet research in the US (Stephens et al, 1994) using cognitive-behavioural techniques has been as successfully applied to the treatment of cannabis dependence as many other drugs. With increases in the numbers of people seeking assistance, further research is required to investigate how current techniques may be modified and refined to best assist those who require intervention. This research could include investigations of brief versus longer therapy, group versus individual methods of delivery, and the role of cannabis withdrawal in relapse.

There is also a potential role for generalist health professionals, such as general medical practitioners, in providing advice and information to cannabis smokers, and directing them to more specialised treatment, if it is requested. Approximately half (52%) of this group had either been questioned about their cannabis use, or discussed their use with health professionals such as medical practitioners. In general little comment was made or advice

provided on use. It is uncertain whether this was because advice was not requested, or because health professionals have not been educated about how to advise their patients. This suggests the need for health professionals to be able to provide information on the known health effects of cannabis, and to make referrals to more specialist services (see Hall, 1995).

4.6 Study Limitations

A detailed examination of the limitations presented by this type of research is described by Didcott and colleagues (1997).

Briefly, the issues are:

4.6.1 Sample Representativeness

It is difficult to ensure a random or representative sample of illicit drug users when the total population of such users is unknown. Due to the cost and time constraints of obtaining such a sample from the general population, it is common to use convenience samples of these groups. This study used a combination of advertising and snowball sampling techniques to recruit long-term users. It succeeded in recruiting a variety of heavy cannabis smokers, but it is not possible to say how representative this group is of all long-term cannabis users. It is likely that advertising attracted users for different reasons to the North Coast study which used well-known and respected peer interviewers to develop snowballs from social networks.

This project may have attracted those users who were interested in having their voices heard with regard to their using experiences, whether positive or negative. As noted previously, it is also possible that sampling bias may have arisen in favour of recruiting those who had experienced problems with cannabis. That is, those who were more troubled or concerned may have responded to the advertisements in hopes of finding out more about effects of their use. Regardless of this potential bias, we succeeded in recruiting users from all regions of Sydney with a variety of using histories and experiences.

This group did appear to be broadly different to the general population of Sydney, as assessed in the 1991 Australian Population Census. A comparison revealed greater proportions of the sample of cannabis users were Aboriginal and Torres Strait Islanders, better educated, unemployed, sole parents and living alone. Whether these differences are indicative of general differences between cannabis users and the broader population remains to be seen. However, a number of differences were also observed when the North Coast cannabis sample was compared to the general population of the rural north of NSW.

4.6.2 Data Validity

The possibility that users may minimise the personal adverse consequences of use when relying on self-report data about illegal activities is always present. Guarantees of anonymity and confidentiality were provided to all participants in this study. As with the North Coast study, confidence in the validity of this data is increased by consistencies between drug use and health data in this sample and the wider research literature. Data validity is also supported by the genuine interest of many respondents in this research, and their willingness to be involved in ongoing interviews on their experiences of cannabis use. Nevertheless, it is not always possible to be accurate, especially when recalling behaviour which occurred long ago.

4.6.3 Study Design Limitations

Limited causal inferences can be drawn from a cross-sectional study of this type. This is related to factors such as the lack of a comparison group of non-smokers asked similar questions, and differences in sampling and measurement techniques between different studies. Further, the relatively small sample size meant there was limited statistical power to detect differences in rates of certain health outcomes. Caution must also be exercised when interpreting the possible causal role of cannabis in reported health effects, such as respiratory problems.

Despite these limitations, this is still one of few studies of the patterns and experiences of long-term cannabis users. This research will hopefully generate further hypotheses that may be addressed by future research.

4.7 Research and Clinical Implications

This exploratory study has identified similarities in the characteristics and experiences of long-term cannabis users residing in Sydney and on the NSW North Coast. This is particularly evident when examining reasons for cannabis use, patterns of other drug use, beliefs about and experiences of the health effects of cannabis and psychological well-being. However, it also confirms the existence of different "cultures" in each area, in which the broader population's mores concerning cannabis influence patterns of use and perceptions of problematic use patterns. The differences observed are consistent with what one might expect, given the more heterogenous Sydney population and its less politicised cannabis culture.

Further research is required to ascertain how representative these samples and their experiences are of long-term cannabis users in general. Both groups appear different from the general population, but it is not clear if these discrepancies are representative of more general differences between long-term users and the broader population. Research on long-term cannabis users in other metropolitan areas and in different stages of use (e.g., those seeking treatment) may help illuminate issues which are culturally mediated, and those which may be common to long-term users in different settings.

This study highlights the need for further investigation into the implications of dependence as a personal and public health issue. Not only should the prevalence of dependence continue to be measured among different populations, but the personal meanings of dependence and its impact on people's daily functioning, should be assessed. It is clear that many people diagnosed as dependent do not believe the personal costs outweigh the benefits of use, and may disagree with a dependence diagnosis. Nevertheless, there were many obvious tensions between positive and negative experiences of use, which seemed to indicate ambivalence about the overall experience of cannabis use. This research indicates an ongoing need to identify who is likely to become dependent, when dependence does become a problem, and how to assist those who develop problematic use patterns. All research should examine

gender differences in patterns and experiences of use.

The one year follow-up of this sample will aid in our understanding of the role dependence may play in the natural history of use. Further research should also examine dependence issues in populations where cannabis has been identified as a problem, such as those seeking help to modify their use. This would allow an examination of the relationship between dependence and treatment outcome. This has been examined only to a limited extent to date because of the dearth of treatment outcome research among cannabis users. However, it is important to examine the role dependence plays in this process, and to compare it to similar research conducted on other drug classes.

Research should also consider the measurement issues raised in this study. Further validation of the different dependence scales is important, among cannabis users and long-term users of other drugs, as the shorter scales have the potential to be used in a variety of research and clinical settings. This would include an examination of appropriate diagnostic cut-offs, and levels of agreement between instruments, in a variety of populations and/or settings. While the SDS shows good psychometric properties among a number of different populations, there is a lack of validation of the other short measures. There is also a need to further examine the validity and reliability of the CIDI, the "gold standard" dependence measure, among cannabis users. This would allow for a fuller understanding of the dependence syndrome among cannabis users compared to users of other drugs.

It is also important to attempt to assess the seriousness of potential health problems associated with cannabis use. In particular, there is a need to clarify the role of cannabis in respiratory disease. This will require a careful examination of the role of tobacco use, and any possible interaction between the two. Given the often hazardous alcohol consumption among this group, an examination of the role of cannabis and alcohol in accidental injury is also required.

This research has raised a number of clinical issues. Consistent with the North Coast study and a number of epidemiological studies, this research indicates that polydrug use, particularly hazardous alcohol use and tobacco smoking, are common. Attention needs to be paid to screening for co-morbid disorders in this group. Not only was alcohol consumed at hazardous or harmful levels by well over half the drinkers in this sample, but such alcohol use was an independent predictor of severity of DSM-III-R cannabis dependence. As more than half the sample had been questioned about their cannabis use by a generalist health worker, the potential for screening in this setting needs to be assessed. Generalist health workers should be educated on the effects of cannabis use, and able to provide information and referral to appropriate interventions.

Users need to be provided with credible information and education on the potential risks associated with use, such as realistic and up-to-date information on the risk of developing dependence. This is probably more like the risk of developing dependence on alcohol rather than heroin. Specific information on safer ways of using are also necessary. This may include information on the potential health risks of mixing cannabis and tobacco for the respiratory system, and mixing cannabis and alcohol for tasks such as driving and operating machinery. The risk of adverse psychological consequences should not be overstated, but should be acknowledged for certain people or at certain times. Different strategies may be

needed with groups such as adolescents, long-term users and the general public. While limited resources have been developed by user groups and government agencies such as departments of health and education, their effectiveness has not been evaluated.

The provision of treatment services such as counselling, self-help groups and telephone advice services were seen as desirable by many. There is a need to continue to evaluate the best approaches to providing services for those who wish to quit or modify their use. Further investigation into the characteristics and duration of cannabis withdrawal, and its role in relapse is also required. Users should be aware of available services, and that problematic cannabis use can be addressed in much the same way as problematic use of many other drugs.

In summary, this research has provided important baseline data on an urban population of long-term cannabis users. It has identified the common experience of cannabis dependence among this group, and has highlighted areas in which research may further illuminate the characteristics and risks of developing such dependence. This study has also noted potential health risks of long-term use, and identified clinical issues which may require addressing in generalist and specialist health settings. Finally, this research highlights the need for further credible information to be provided to a variety of groups in order to minimise the harms associated with cannabis use.

CHAPTER 5

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APPENDIX A
MULTIVARIATE ANALYSES OF PREDICTORS OF SEVERITY OF DEPENDENCE

DSM-III-R

Age, gender, the log of "standard" cones consumed per day in the last month, age of first use, AUDIT score and number of illicit drugs other than cannabis ever used were simultaneously entered into a linear regression model. After adjusting for all other variables, age of first use and number of illicit drugs used were not significant predictors of severity of dependence. These items were removed from the model and the remaining variables entered simultaneously.

All remaining variables significantly predicted severity of lifetime DSM-III-R cannabis dependence. This model ($F_{4,183}$=6.87, p<0.0001) accounted for only a modest percentage (13.1%) of total variance. Removal of these variables produced virtually no change in the adjusted R square (0.12 to 0.11), suggesting their addition had not improved the model's ability to predict severity. Age had a significant negative correlation with severity (β=-0.05, p=0.02), such that older respondents met fewer symptoms of lifetime dependence. Women were significantly more likely than men to have more dependence symptoms (β=-0.80, p=0.01), despite having used for significantly fewer years. Quantity of use in the previous month was also positively correlated with severity (β=0.94, p=0.02), as was the score on the AUDIT (β=0.05, p=0.02), suggesting co-morbidity between alcohol and cannabis problems.

There were no interactions between age and AUDIT scores or gender and AUDIT scores, and an analysis of the residuals did not provide any evidence for violations of the assumptions of linear regression.

ICD-10

Age, log of quantity consumed in the last month, frequency of use and AUDIT score were simultaneously entered into the model, with the latter two variables failing to predict number of ICD-10 symptoms. The final model contained age and the log of standard cones consumed ($F_{2,194}$=21.34, p<0.0001) and accounted for a modest 17% of the variance. Again, there was little change in the adjusted R^2 value between the two models (a change of 0.033). As for the DSM-III-R dependence measure, age was negatively correlated with number of ICD-10 criteria experienced in the last year (β=-0.06, p<0.0001), while quantity used in the last month was positively associated with severity (β=0.37, p<0.0001).

UM-CIDI

Age, log of quantity consumed, frequency of use, age of first use and AUDIT score were simultaneously entered into the regression model. Frequency of use and age of first use failed to significantly predict the score on the short CIDI, and the remaining variables constituted the final model ($F_{3,184}$=28.7, p<0.0001). This model accounted for one third (32%) of the variance in outcome, and there was little change in the adjusted R^2 between the models. Again, age was negatively associated with UM-CIDI score (β=-0.09, p<0.0001), while the remaining variables were positively associated with outcome. Thus, the greater the log of cones consumed per day (β=0.46, p<0.0001) and the greater the score indicating harmful

alcohol consumption (β=0.05, p=0.01), the higher the score on the UM-CIDI.

SDS

Age and the log of cones consumed in the last month were entered simultaneously into a linear regression model, and both remained significant. Again, this model ($F_{2,196}$=16.48, p<0.0001) accounted for only a modest proportion of the total variance. Age remained negatively correlated with SDS score (β=-0.06, p=0.04), implying that older respondents were less concerned about their use in the last year. The log of quantity consumed in the past month was positively associated with SDS scores (β=0.85, p<0.0001), indicating that the more a respondent consumed, the more their scores indicated concern over use.

APPENDIX B
RECEIVER OPERATING CHARACTERISTIC (ROC) ANALYSES

Ontario Adult Drug Use Questionnaire (ICD-10)

In the general population samples for which this test was developed, at least three criteria had to be met by the respondent to warrant a diagnosis of dependence. The performance of the Ontario questionnaire in discriminating between "cases" and "controls" in the analysis using severe dependence as a "case" is represented in an ROC curve. The area under the curve (AUC) can have a value between 0.5, which represents a true case being diagnosed by chance, and 1.0, which represents perfect discrimination between cases and controls. The area under the curve was 0.80, which indicates a good discrimination between those with severe dependence in the last year and those without. The ROC analysis also presents the sensitivity and specificity of each of the cut-off values of the Ontario questionnaire, and their corresponding chi-squares. The cut-off with the highest chi-square represents the value that best discriminates between the presence or absence of a DSM-III-R diagnosis of severe cannabis dependence. Thus, in this population a cut-off of three (χ^2=40.6) was optimal, meaning that a score of 3 or more criteria was a good indicator of dependence. This compared to the originally specified cut-off, which required that only 3 or more criteria were met.

The second set of ROC analyses, using at least moderate dependence as a "case" produced little difference in the AUC, although there was a small increase in its discriminative ability (0.83 compared to 0.80). However, there was no difference in the optimal cut-off for this questionnaire, with a value of 3 (χ^2=57.1) representing the best trade-off in terms of sensitivity and specificity, in discriminating between those with and without moderate or more severe cannabis dependence. The similarity in the results of these two analyses suggests that in this population the Ontario questionnaire discriminated equally well between those with and without severe cannabis dependence, and those with and without moderate or more severe cannabis dependence.

The UM-CIDI

A score of at least 3 was considered to be indicative of dependence in the population on which this instrument was developed. In the first analysis, severe dependence was compared to each value of the UM-CIDI. The area under the curve was 0.78, which represents good discrimination, but does not perform as well as the Ontario questionnaire. The optimal cut-off on this scale was 3 (χ^2=37.9) , indicating that those scoring at least 3 could be considered to be dependent.

The second analysis of at least moderate dependence produced similar results. Again, there was an increase in the AUC (=0.83), with the UM-CIDI having better discriminative power when a "case" is defined this way. Again, a cut-off of 3 (χ^2=50.9) was optimal, which is also the same as the original cut-off developed in the general population. As for the Ontario questionnaire, there was little difference in the UM-CIDI's ability to discriminate between the presence or absence of dependence using the two definitions of a "case".

The SDS

This questionnaire has typically used a cut-off of 4, although it was generally developed for use in populations of injecting drug users. The first analysis estimated its ability to discriminate between the presence and absence of severe cannabis dependence in the last year. The AUC was 0.79, while the optimal cut-off was 3 (χ^2=40.2), meaning that anyone scoring 3 or more could be considered dependent. This score is lower than that found in the groups on which it was developed, who were predominantly users of heroin, amphetamine and cocaine.

When a "case" was defined as moderate dependence, the AUC decreased to 0.77, which was the lowest of all the analyses. However, 3 (χ^2=40.3) remained the optimal cut-off in this population of long term cannabis users. As with the other two instruments, there was little difference between the results using the severe and moderate definitions of a "case".

APPENDIX C
UNIDIMENSIONALITY (PRINCIPAL COMPONENTS ANALYSES)

The CIDI-SAM

The nine criteria comprising the DSM-III-R dependence diagnosis comprised binary variables - that is, the criteria were present or absent for each respondent. Tetrachoric correlation coefficients were submitted to a standard principal components analysis. The un-rotated and rotated solutions are presented in Table A. The un-rotated solution produced 3 components. The first PC accounted for 40% of the total variance. Five criteria had substantial (>0.30) positive loadings on this PC: Criterion 1(use longer than intended), Criterion 3 (lots of time using), Criterion 4 (frequent intoxication), Criterion 7 (tolerance) and Criterion 8 (withdrawal). Criteria 2, 5 and 9 were also highly correlated, but had a negative loading.

Orthogonal rotation produced 3 new PCs. The first PC accounting for 28% of the total variance in the nine criteria, and only 3 criteria had substantial positive loadings on the first PC. These were Criterion 2: failed quit attempts, Criterion 5 (neglecting other activities) and Criterion 9 (withdrawal relief). Criterion 8 (withdrawal) had the highest loading with the first PC, but it was negatively correlated. The second PC also accounted for 28% of the total variance, and had a substantial positive relationship with 4 criteria: Criterion 3 (lots of time using), Criterion 4 (frequent intoxication), Criterion 6 (use despite problems) and Criterion 7 (tolerance). Criterion 5 (neglecting activities) had a high negative loading on this PC. The third PC accounted for 16% of the total variance; only Criterion 1 (use for longer than intended) had a high positive loading. Cronbach's alpha for these criteria was 0.67.

Table A: The Structure of the Cannabis Dependence Syndrome as measured by the CIDI-SAM

	Un-rotated			**Rotated**		
	PC1	PC2	PC3	PC1	PC2	PC3
DSM-III-R Criteria						
use longer than intended	0.57	-0.11	-0.73	-0.17	0.22	0.89
failed quit attempts	-0.74	0.32	0.07	0.68	-0.21	-0.38
lots of time using	0.74	0.25	0.05	-0.39	0.66	0.16
frequent intoxication	0.49	0.61	-0.29	0.14	0.76	0.32
neglect activities	-0.82	-0.31	0.06	0.36	-0.76	-0.28
use despite problems	0.26	0.76	0.49	0.09	0.78	-0.51
tolerance	0.45	0.16	0.09	-0.25	0.42	0.04
withdrawal	0.71	-0.52	0.32	-0.93	0.06	0.05
withdrawal relief	-0.74	0.45	-0.32	0.91	-0.15	-0.05
Eigenvalue	3.64	1.71	1.08	2.55	2.49	1.40

% Variance	40.5	19	12	28.3	27.5	16

The Ontario Adult Drug Use Questionnaire

Tetrachoric correlations were submitted to principal components analysis (see Table B). Two un-rotated PCs were extracted, the first accounting for 50% of the total variance among the 6 ICD-10 criteria, and the second for 18% of the variance. All 6 criteria had substantial loadings on the first PC, although Criterion 3 (withdrawal) had a negative correlation. The second PC had a substantial positive correlation with Criterion 1 (urge to use).

Orthogonal rotation of the components produced two new PCs accounting for 39% and 29% of the total variance, respectively. Five of the six criteria had substantial loadings on the first rotated PC; the only criterion with a correlation of less than 0.30 was Criterion 1, which measured urge to use cannabis. Criterion 1 and Criterion 4 (tolerance) had substantial positive loadings on the second PC. Cronbach's alpha for the six ICD-10 criteria as measured in this scale was 0.66.

The UM-CIDI

Principal components analyses of tetrachoric correlation coefficients between the 7 items of this scale yielded two PCs (see Table B). The first un-rotated PC accounted for 42% of the total variance among the items; all items had substantial loadings on this component but two of these were negatively correlated (item 3:use despite problems, and item 4: inability to resist using). The first two items (use in inappropriate or dangerous situations) loaded more highly on the second PC, which accounted for 16% of the total variance.

Orthogonal rotations produced two new PCs, describing 38% and 19% of the total variance, respectively. This solution appeared to divide items into two groups: items that measured impaired control, use despite psychological consequences and tolerance, all of which loaded more highly on PC 1; and items that measured use in inappropriate or dangerous circumstances, which loaded on PC 2. Cronbach's alpha for this scale was 0.62.

The SDS

As each of the 5 items on the SDS allowed for four response options, and the responses on each item were approximately normally distributed, Pearson product moment correlations were submitted to PCA (see Table C). One principal component (eigenvalue =3.1) accounting for 62% of the total variance was extracted, and all items had positive factor loadings in excess of 0.50 on this component. No rotation was performed as no other principal component with an eigenvalue of more than one was identified. Cronbach's alpha for the scale was 0.85 indicating good internal reliability.

Table B: Structure of the Cannabis Dependence Syndrome as measured by the ICD-10 Criteria and the UM-CIDI

	Un-rotated		**Rotated**	
	PC1	PC2	PC1	PC2
ICD-10 Criteria				
urge to use	0.55	0.73	0.02	0.91
impaired control	0.64	-0.59	0.86	-0.11
withdrawal	-0.74	0.03	-0.63	-0.41
tolerance	0.73	0.34	0.39	0.70
neglect activities	0.83	-0.12	0.75	0.38
use despite problems	0.71	-0.20	0.70	0.25
Eigenvalue	3.00	1.06	2.34	1.72
% Variance	49.9	17.6	38.9	28.6
UM-CIDI Items				
use when inappropriate	0.45	0.69	0.17	0.80
use when dangerous	0.33	0.68	0.06	0.76
use despite psychological problems	-0.53	0.29	-0.60	0.07
inability to resist	-0.71	0.06	-0.68	-0.20
a lot of time using	0.78	-0.11	0.76	0.18
use more than intended	0.84	-0.20	0.85	0.12
tolerance	0.74	-0.12	0.73	0.16
Eigenvalue	2.94	1.09	2.69	1.34
% Variance	42.0	15.6	38.5	19.1

Table C: Structure of the Cannabis Dependence Syndrome as measured by the SDS.

	PC1
SDS Items	
Use out of control	0.88
Anxious about missing a smoke	0.77
Worry about use	0.79
Desire to stop	0.76
Difficulty in stopping	0.73
Eigenvalue	3.11
% Variance	62.2