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Alcohol use disorders in Australia: Findings from the National Survey of Mental Health and Well-Being

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NATIONAL SURVEY OF MENTAL HEALTH AND WELL-BEING

This is the fifth in a series of linked NDARC Technical Reports on various aspects of the National Survey of Mental Health and Well-being (NSMHWB). This survey was a major collaborative effort between numerous Australian academics and institutions. It was funded by the Mental Health Branch of the Commonwealth Department of Health and Aged Care. Fieldwork was conducted by the Australian Bureau of Statistics in 1997. It provides the first data on the prevalence and correlates of common mental health and substance use disorders among a representative sample of more than 10,000 Australians aged 18 years and over.

Each of these Technical Reports addresses separate issues related to findings on substance use disorders among Australian adults.

The list of Technical Reports on this topic published to date are:

Hall, W., Teesson, M., Lynskey, M., & Degenhardt, L. (1998). The prevalence in the past year of substance use and ICD-10 substance use disorders in Australian adults: Findings from the National Survey of Mental Health and Well-being (Technical Report No. 63).

Swift, W., Hall, W., & Teesson, M. (1999). Cannabis use disorders among Australian adults: Results from the National Survey of Mental Health and Wellbeing (Technical Report No. 78).

Degenhardt, L., & Hall, W. (1999). The relationship between tobacco use, substance use disorders and mental disorders: Results from the National Survey of Mental Health and Well-Being (Technical Report No. 80).

Degenhardt, L., & Hall, W. (2000). The association between psychosis and problematic drug use among Australian adults: Findings from the National Survey of Mental Health and Well-Being (Technical Report No. 93).

Degenhardt, L., Hall, W., Teesson, M., & Lynskey, M. (2000). Alcohol use disorders in Australia: Findings from the National Survey of Mental Health and Well-Being (Technical Report No. 97).

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The development and testing of the computerised survey instrument was undertaken by Gavin Andrews, Lorna Peters, and other staff at the Clinical Research Unit for Anxiety Disorders, and the WHO Collaborating Centre in Mental Health at St Vincent's Hospital. The design of the survey was overseen and the instrument approved by the Technical Advisory Group to the Survey, which consisted of the following persons:

Professor A. Scott Henderson, Chair
Professor Gavin Andrews
Professor Wayne Hall
Professor Helen Herman
Professor Assen Jablensky
Professor Bob Kosky

The fieldwork and implementation of the Survey, the enumeration, compilation and initial analyses of the data were undertaken by the Australian Bureau of Statistics. We thank Tony Cheshire, Gary Sutton and Marelle Lawson for their assistance.

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EXECUTIVE SUMMARY

In 1997, the Australian Bureau of Statistics (ABS) conducted the National Survey of Mental Health and Well-Being (NSMHWB), the first population survey of the prevalence of alcohol use disorders (alcohol abuse and dependence) in the Australian population. This technical report presents the overall findings from the survey on the prevalence, and correlates of alcohol use disorders, rates of covariance with other mental disorders and substance use disorders (comorbidity), and the prevalence of alcohol dependence symptoms in the Australian population.

The present report examined the prevalence and correlates of alcohol use, DSM-IV alcohol abuse, and DSM-IV alcohol dependence within the past 12 months in the Australian population. It examined patterns of comorbidity between alcohol use and other substance use problems, and other mental health problems. Multivariate analyses were conducted to examine whether any observed associations remained after controlling for demographics, neuroticism and other substance use. Analyses were also conducted of the symptoms of alcohol dependence reported in the general population. The level of agreement between ICD-10 and DSM-IV diagnostic systems was also calculated.

Men were more likely than women to report drinking, meet criteria for alcohol abuse and for alcohol dependence. There was a pronounced age-related pattern of involvement with alcohol, with the youngest age group (those aged 18-24 years) most likely to meet criteria for alcohol abuse (5.2%) and for dependence (9.3%). Those who were married or in a defacto relationship were more likely to report drinking but less likely to report problematic drinking than those who had never been married, or who were separated or divorced. Those who were unemployed were most likely to meet criteria for alcohol abuse or dependence.

Alcohol use was strongly related to the use of other drug types. Those who did not report alcohol use within the past 12 months were least likely to report using tobacco, cannabis, sedatives, stimulants or opiates. As the level of involvement with alcohol increased, so too did the prevalence of other drug use and other drug use disorders. Half (51%) of those who were alcohol dependent were regular smokers, one third had used cannabis (32%), and 15% reported other drug use; 15% met criteria for a cannabis use disorder and 7% met criteria for another drug use disorder. In comparison, 15% of non-drinkers were regular smokers, 2% reported cannabis use in the past year, 3% reported other drug use. Less than one per cent of non-drinkers met criteria for a cannabis or other drug use disorder.

Persons who met criteria for alcohol dependence were most likely to also meet criteria for an anxiety (20%) or an affective (24%) disorder. Those who were non-drinkers were more likely to meet criteria for anxiety and affective disorders than non-problematic drinkers (anxiety 6.5% vs. 4.5%; affective 7.3% vs. 5.5%). On symptom measures of mental health and well-being, those who were alcohol dependent reported the poorest levels of mental health, and non-drinkers reported poorer mental health than non-problematic drinkers.

The most commonly reported symptoms of DSM-IV alcohol dependence in the Australian population were using for longer than intended or in larger amounts than intended (15% of drinkers), persistent desire for alcohol use (12%) and tolerance to the effects of alcohol (10%). Large proportions of male drinkers reported dependence symptoms, and the criteria discriminated well between dependent and non-dependent drinkers. Analyses suggested that the DSM-IV criteria

formed a unidimensional syndrome of severity.

There was good agreement between ICD-10 and DSM-IV diagnostic systems in which persons received a dependence diagnosis. There was almost no agreement between the diagnosis of alcohol abuse in DSM-IV and harmful use in ICD-10, suggesting that the two systems identify different persons reporting problems from their alcohol use.

Alcohol use disorders are among the most prevalent disorders in the community. They are most likely to occur among males aged 18 to 24 years. They are also associated with higher rates of other substance use problems and other mental health problems than occur among persons without alcohol use disorders. Very few persons with these disorders seek or receive treatment. This does not necessarily indicate that these disorders are grossly under-treated since many will remit without specialist help. Public education about the risks of alcohol use may be the best way to target the prevalent, milder forms of alcohol disorders. Self-help strategies for quitting or cutting down may remove the need for professional help in those coming to attention in primary health care. For more severe cases whose problems resist self-help, existing treatment systems need to provide more effective forms of treatment, more efficiently. Better triage would ensure a more rational use of scarce treatment resources.

1 INTRODUCTION

Alcohol is one of the most commonly used psychoactive substances in the Western world. In Australia, most adults have used alcohol at some point in their lives. In 1998, the Australian National Drug Strategy Household Survey produced estimates that around 9 in 10 persons aged 14 years and over had used alcohol at some point in their lives, with 83% having done so in the past year (Australian Institute of Health and Welfare, 1999).

To date, most population surveys of alcohol use have focussed on the typical quantity of alcohol consumed (e.g. (Australian Institute of Health and Welfare, 1999; Makkai & McAllister, 1998). In 1997, the Australian Bureau of Statistics (ABS) conducted the National Survey of Mental Health and Well-Being, the first Australian population survey of the prevalence of mental disorders, which included alcohol use disorders (alcohol abuse and dependence). This technical report presents the overall findings from the survey on the prevalence and correlates of DSM-IV alcohol use disorders.

1.1 WHAT IS AN ALCOHOL USE DISORDER?

In 1977, Edwards and colleagues suggested that alcohol dependence could be considered to be a cluster of symptoms occurring in heavy drinkers that were distinguishable from alcohol-related problems. Seven factors were regarded as major symptoms of alcohol dependence:

- Narrowing of the behavioural repertoire;
- Salience of drinking (giving greater priority to alcohol use);
- Subjective awareness of a compulsion (experiencing loss of control over alcohol use, or an inability to stop using);
- Increased tolerance (using more alcohol to get the same effects, or finding that the same amount of alcohol has less effect);
- Repeated alcohol withdrawal symptoms (such as fatigue, sweating, diarrhoea, anxiety, trouble sleeping, tremors, stomach ache, headache, hallucinations, fever);
- Relief or avoidance of withdrawal symptoms by further drinking; and
- Reinstatement of dependent drinking after abstinence.

Research examining this syndrome suggests that it is reasonably close to clinical reality (Babor, 1990). The construct is also useful in predicting treatment outcome, with greater levels of dependence predicting poorer treatment outcome (Hodgson, 1979; Rankin, 1982).

The present technical report used the DSM-IV operationalisations of the alcohol dependence syndrome, and of the alcohol abuse syndrome. DSM-IV Substance Abuse criteria require a pattern of substance use that is causing clinically significant distress or impairment (American Psychiatric Association, 1994). This distress or impairment may involve: a failure to fulfil role obligations due to substance use; substance use in hazardous situations, or legal, social or interpersonal problems resulting from substance use.

DSM-IV Substance Dependence criteria require a cluster of three or more indicators that a person continues to use the substance despite significant substance related problems (American Psychiatric Association, 1994). These include: tolerance to the effects of the substance; a withdrawal syndrome

on ceasing or reducing use; using the substance in larger amounts or for a longer period than intended; a persistent desire or unsuccessful efforts to reduce or cease use of the substance; a disproportionate amount of time spent obtaining, using and recovering from substance use; social, recreational or occupational activities are reduced or given up due to substance use; and continuing substance use despite knowledge of physical or psychological problems caused by such use.

1.2 EPIDEMIOLOGY OF ALCOHOL USE DISORDERS

Internationally, several large-scale studies have been carried out to assess the mental health characteristics of representative samples of the general population. For example, in 1984, the Epidemiological Catchment Area (ECA) study was carried out, involving representative samples of the population in five sites across the US (Robins & Regier, 1991). The lifetime prevalence of DSM-III alcohol abuse and/or dependence was 13.8% (Helzer, Burnam, & McEvoy, 1991). Approximately 6.8% of persons met criteria for DSM-III abuse and/or dependence within the past 12 months (Helzer et al., 1991).

The National Comorbidity Survey (NCS) was conducted in the early 1990s with a nationally representative sample of US adults aged 15 to 54 years (Kessler et al., 1994). Within the past 12 months, 2.5% of persons met criteria for DSM-III-R abuse and 4.4% for dependence (Kessler et al., 1997). The US National Longitudinal Alcohol Epidemiological Survey produced a prevalence estimate of 4.4% DSM-IV alcohol dependence in the past year (Grant, 1997).

The Ontario Mental Health Survey, conducted with a representative sample of adults aged 15 to 64 years in Ontario, estimated that 1.5% of adults met criteria for DSM-III-R alcohol abuse within the past year, and 2.9% met criteria for dependence (Ross, 1995).

Several factors have been consistently related to alcohol use disorders. Gender is a strong predictor, with males being more likely to use alcohol than females (Kandel, Chen, Warner, Kessler, & Grant, 1997), and to meet criteria for alcohol use disorders (Anthony, Warner, & Kessler, 1994; Helzer et al., 1991). Age is also a strong predictor of alcohol use disorders, with younger persons more likely to meet such criteria than older persons (Anthony et al., 1994; Helzer et al., 1991; Kandel et al., 1997; Prescott, Neale, Corey, & Kendler, 1997).

Research has found that education is negatively related to involvement with alcohol use (Fillmore et al., 1998b) and use disorders (Helzer et al., 1991; Kandel et al., 1997): less educated persons have an increased risk of developing alcohol abuse and dependence (Crum, Bucholz, Helzer, & Anthony, 1992; Crum, Helzer, & Anthony, 1993). Individuals with heavier alcohol use, and those who meet criteria for alcohol use disorders, have been found to be more likely to be unemployed (Helzer et al., 1991).

These data may suggest the patterns that might be found in Australia, however no Australian research has previously examined the prevalence and correlates of DSM-IV alcohol use disorders. Social, demographic and cultural factors may mean that alcohol use disorders are differently distributed and experienced in the Australian population. This is particularly the case given differences in the legal age of drinking compared to the US for example.

1.3 COMORBIDITY

The chronic heavy use of alcohol is associated with adverse health outcomes, such as liver cirrhosis, heart disease, cancers and other medical problems (English et al., 1995; Hanna, Chou, & Grant, 1997; NIAAA, 1997), many of which cause premature death. However, some researchers have reported a "J-shaped" relationship between alcohol use and physical health (particularly cardiovascular health). Light drinkers report fewer medical problems, particularly cardiovascular disease, than both non-drinkers and heavy drinkers (e.g. (Chyou et al., 1997; Thun, Peto, Lopez, & al., 1997). This finding has led to suggestions that moderate alcohol use may have a protective effect upon the cardiovascular system. However, others have asserted that this apparent curve may be due to the confounding effects of the different characteristics of these groups, such as socio-economic status (SES), employment, education, age and gender (Fillmore et al., 1998a; Fillmore et al., 1998b; Hanna et al., 1997; Leino et al., 1998).

Alcohol use and alcohol use disorders are also associated with other substance use disorders. US surveys have found an association between daily cigarette smoking and alcohol use (Henningfield, Clayton, & Pollin, 1990). Clinical research has suggested that persons with substance use disorders are more likely than those with other mental disorders to use tobacco (Hays, Farabee, & Miller, 1998). Research on twins has found that women with alcohol dependence are highly likely to also suffer from depression (Kendler, Heath, Neale, Kessler, & Eaves, 1993). Increased rates of tobacco use have been reported by patients reporting greater use of alcohol (Henningfield et al., 1990), among outpatients with more symptoms of problematic use of alcohol (Hays et al., 1998; Henningfield et al., 1990), and among those meeting criteria for alcohol dependence (DiFranza & Guerrera, 1990).

The ECA found that those with alcohol abuse or dependence were significantly more likely to have used other drugs, and to meet criteria for another drug use disorder (Helzer et al., 1991). Just over one in five persons (22%) meeting lifetime criteria for alcohol abuse or dependence also met criteria for another drug use disorder, with the majority of such persons meeting criteria for a cannabis use disorder (Helzer et al., 1991).

Similar results were also found in the NCS. Those who met criteria for alcohol abuse or dependence at some time in their lives were more likely to also meet criteria for drug abuse or dependence. Drug use disorders were reported among around one third of persons with lifetime alcohol abuse (30% of men, and 33% of women) and among just under half of persons meeting lifetime criteria for alcohol dependence (41% of men and 47% of women) (Kessler et al., 1997).

Alcohol use disorders and affective or anxiety disorders are also likely to co-occur. The ECA found that persons with alcohol abuse or dependence were significantly more likely to meet criteria for an affective disorder such as mania (5.4 times more likely), major depression (1.6 times) or dysthymia (1.7 times) (Helzer et al., 1991). There were similarly elevated rates of anxiety disorders (panic disorder, obsessive-compulsive disorder, or phobic disorder) (Helzer et al., 1991). These findings were replicated in the NCS (Kessler, 1995; Kessler et al., 1997). A population survey of British adults also found that those with higher levels of anxiety tended to have more problematic alcohol use (Farrell et al., 1998).

Temperament may also be associated with alcohol use, particularly the trait of neuroticism: persons scoring high on measures of neuroticism have been characterised as more anxious, worried, depressed and moody (Eysenck & Eysenck, 1991). Research has shown that persons with heavier

alcohol use are likely to have higher scores on measures of neuroticism than those with less heavy use (Ogden, Dundas, & Bhat, 1989; Prescott et al., 1997; Rankin, Stockwell, & Hodgson, 1982; Sieber & Angst, 1990). Anxiety and depression are also strongly related to higher levels of trait neuroticism (Kendler, Neale, Kessler, Heath, & Eaves, 1992; Martin, 1985).

Greater problematic involvement in alcohol use appears to be associated with higher rates of other mental disorders. However, the characteristics of those using alcohol without meeting criteria for a lifetime disorder, and those who abstained from alcohol, have not been examined. Recently, a study of British adults reported that heavy alcohol use and no alcohol use were associated with greater psychological distress than moderate alcohol use (defined as number of alcohol units consumed per week) (Power, Rodgers, & Hope, 1998). The researchers suggested this reflected the existence of a "J" or "U" curve for mental health, similar to the one that arguably exists for physical health (Chyou et al., 1997; Sacco et al., 1999; Thun et al., 1997). While the analysis was suggestive of such a relationship, further exploration of these initial findings is needed. Specifically, there was no consideration of the influence of demographic characteristics on psychological distress scores.

1.4 THE ALCOHOL DEPENDENCE SYNDROME

The structure of alcohol dependence has been examined in treatment samples (e.g. (Caetano, Medina Mora, Schafer, & Marino, 1999; Chick, 1980). Analyses of clinical samples in six countries (Australia, The US, Norway, Bulgaria, Kenya and Mexico) found that one Principal Component accounted for more than 50% of the variance of 13 items assessing alcohol dependence, which was taken to indicate that there was a unidimensional alcohol dependence syndrome (Hall, Saunders, Babor, & al., 1993). Population level research has been conducted in the US, which also found that the alcohol dependence syndrome formed a unidimensional syndrome (Muthen, 1995). Other analyses revealed that items assessing ICD-10 dependence had high internal consistency (Allen, Fertig, Towle, & al., 1994). To date no such analysis of DSM-IV alcohol dependence has been conducted in an Australian general population sample.

Previous work has analysed the agreement between different diagnostic systems in the classification of persons as meeting criteria for abuse or dependence of substances (Andrews, Slade, & Peters, 1999; Hasin et al., 1997; Hasin, Li, McCloud, & Endicott, 1996a; Hasin, McCloud, Li, & Endicott, 1996b). This has found that there has been good agreement between diagnostic systems such as ICD-10 and DSM-IV in diagnoses of dependence, but very poor agreement in diagnoses of abuse/harmful use (Andrews et al., 1999; Hasin et al., 1997; Hasin et al., 1996a; Hasin et al., 1996b).

1.5 STUDY AIMS

There has been no previous examination of alcohol use disorders in the Australian general population using a standardised diagnostic interview. In 1997, the ABS conducted the National Survey of Mental Health and Well-Being (NSMHWB), which assessed a nationally representative sample of Australian adults aged 18 years and over, for substance use and symptoms of DSM-IV substance use disorders; DSM-IV anxiety and affective disorders; and measures of psychological distress and disability.

The present study analysed data from the NSMHWB to address the following questions:

1. How common are DSM-IV alcohol abuse and alcohol dependence in the Australian population in the past 12 months?

2. Who meets criteria for alcohol use disorders in the Australian population?

3. What are the patterns of comorbidity with other drug use and mental disorders?

4. Which DSM-IV and ICD-10 dependence criteria are Australian drinkers more likely to endorse? Do they discriminate between dependent and non-dependent drinkers?

5. What is the factorial structure of the DSM-IV alcohol dependence syndrome among Australian drinkers? What is the level of agreement between DSM-IV and ICD-10 diagnostic systems?

2 METHOD

The NSMHWB sample was a representative sample of residents in private dwellings across all States and Territories in Australia, conducted by the Australian Bureau of Statistics (ABS) in 1997. The sample excluded special dwellings (hospitals, nursing homes, hostels etc.), and dwellings in remote and sparsely populated areas of Australia. Dwellings were selected using random stratified multistage area sampling, so that each person in all States and Territories had a known chance of participation. One person aged at least 18 years was randomly selected from each dwelling and asked to participate. Approximately 13,600 private dwellings were approached, with a final sample size of 10,641 persons giving a response rate of 78%.

Trained survey interviewers met with each designated respondent to administer the interview. The interviewers were given 24-hour access to a psychiatrist to deal with any concerns that arose in the course of the interview.

Questioning was restricted to symptoms in the last 12 months to minimise the uncertainty about recall of symptoms over longer periods. Mental disorders were assessed by a modified version of the CIDI (World Health Organisation, 1993), which yielded diagnoses of both ICD-10 and DSM-IV disorders. The CIDI is the most widely used interview in large epidemiological studies (Bland, Newman, & Orn, 1988; Robins & Regier, 1991) and CIDI assessments of substance use disorders have been shown to have excellent inter-rater reliability (Cottler et al., 1991; Wittchen et al., 1991) and test-retest reliability (Andrews & Peters, 1998; Cottler et al., 1991; Wittchen et al., 1991). There are fewer studies of the validity of the CIDI assessments for substance use disorders (Andrews & Peters, 1998). In an early study comparing the agreement between the Present State Examination (PSE) and CIDI interviews the agreement for syndromes was adequate (Overall Kappa =0.55) (Farmer, Katz, McGuffin, & Bebbington, 1987). Similarly, Janca et al. (1992) found good levels of agreement between CIDI and clinicians' assessments (Kappa = 0.77). The validity of the CIDI has been further supported by broad agreement between the findings of the ECA and the NCS (Bland et al., 1988; Robins & Regier, 1991). Thus, while community epidemiological surveys may not provide perfect estimates of the prevalence of mental disorders in the community they provide a reasonably reliable and valid portrait of the pattern of disorders in the community.

2.1.1 ASSESSMENT OF ALCOHOL AND OTHER DRUG USE

Respondents were asked if they had consumed at least 12 standard drinks (10g alcohol) within the past 12 months. All those who reported such use, and who had consumed more than 3 standard drinks on one occasion, were assessed for alcohol use disorders. All persons were asked whether they currently used tobacco; if so, they were asked if their use was regular (at least daily). Persons were asked if they had used cannabis, stimulants, sedative or opiates more than five times in the past 12 months; if so, they were assessed for symptoms of a use disorder.

Respondents were asked separate questions about their use of other drugs including cannabis, stimulants, sedatives and opioids. The questions asked about the use of drugs such as marijuana and the "extramedical use" of prescribed drugs such as benzodiazepines. The questions asked whether drugs and medicines had been used "in larger amounts than was prescribed or for a longer period

than was prescribed" or used "more than five times when they were not prescribed for you, to get high, to relax, or to make you feel better, more active, or alert". Additional questions covered age of onset of use, frequency and recency of use of each of four drug groups. The drug groups were selected to reflect the most widely used extramedical drugs among Australian adults, as indicated in the Australian National Drug Strategy Household surveys (Australian Institute of Health and Welfare, 1999) and included:

- cannabis (marijuana & hashish);
- amphetamines, ecstasy, speed and other stimulants which can be obtained by medical prescription including, dexedrine, preludin and ritalin;
- barbiturates and tranquillisers and other sedatives which can be obtained by medical prescription including, ativan, librium, megaton, normison, rohypnol, serepax, valium, xanax;
- opioids such as heroin and opium as well as other opioids and analgesics which can be obtained on medical prescription including, codeine, doloxene, methadone, morphine, percodan and pethidine.

Respondents were given a detailed verbal description of each drug group and lists of drugs in each class. The interviewer read the questions and recorded the participants' responses on a laptop computer. This use of a computer to record answers in real-time differed from the ECA and NCS, which used pencil and paper. Studies have since shown excellent agreement between responses recorded via pencil and paper and those recorded via laptop computer (Peters, Clarke, & Carroll, 1999).

2.1.2 DIAGNOSTIC ASSESSMENT OF MENTAL DISORDERS

The following DSM-IV disorders were assessed in the interview:
1. Substance use disorders: alcohol abuse and dependence, as well as abuse and dependence on: opiates, cannabis, stimulants, and sedatives;
2. Affective disorders: major depressive disorder, dysthymia, bipolar I disorder, bipolar II disorder; and
3. Anxiety disorders: panic disorder, agoraphobia, social phobia, generalised anxiety disorder, obsessive-compulsive disorder, and post-traumatic stress disorder.

The following ICD-10 disorders were assessed in the interview:
1. Substance use disorders: alcohol harmful use and dependence, as well as harmful use and dependence on: opiates, cannabis, stimulants, and sedatives;
2. Affective disorders: major depressive disorder, dysthymia, bipolar affective disorder; and
3. Anxiety disorders: panic disorder, agoraphobia, social phobia, generalised anxiety disorder, obsessive-compulsive disorder, and post-traumatic stress disorder.

2.1.2.1 Diagnostic assessment of alcohol use disorders

DSM-IV Abuse criteria require a pattern of substance use that is causing clinically significant distress or impairment. This distress or impairment may involve a failure to fulfil role obligations, use in hazardous situations, or legal, social or interpersonal problems.

DSM-IV Dependence criteria require a cluster of three or more indicators that a person continues use despite significant substance related problems. These include: tolerance to the effects of alcohol or other drugs; a withdrawal syndrome on ceasing or reducing use; substance used in larger amounts or for a longer period than intended; a persistent desire or unsuccessful efforts to reduce or cease use; a disproportionate amount of time spent obtaining, using and recovering from use; social, recreational or occupational activities are reduced or given up due to substance use; and use continues despite knowledge of physical or psychological problems induced by substance use.

ICD-10 Harmful Use criteria require a pattern of substance use that is causing damage to health. The damage may be physical (e.g. hepatitis from sharing contaminated injecting equipment) or mental (e.g. depression secondary to heavy consumption of alcohol).

ICD-10 Dependence criteria require the presence of three or more indicators of alcohol or other drug dependence. These include: a strong desire to take the substance; impaired control over use; a withdrawal syndrome on ceasing or reducing use; tolerance to the effects of alcohol or other drugs; requiring larger doses to achieve the desired psychological effect; a disproportionate amount of time spent obtaining, using and recovering from use; and continuing to drink alcohol or take other drugs despite associated problems. These problems should have been experienced for at least one-month.

2.1.3 OTHER MEASURES OF MENTAL HEALTH AND WELL-BEING

A short scale was also included that screened for the likelihood of psychosis (the Psychosis Screener (PS)). Analyses suggest that this screener is moderately effective for screening persons who satisfy criteria for schizophrenia or schizoaffective disorder[1].

Several other measures of psychological well-being will be involved in the analyses:

1. Kessler's Psychological Distress scale, which assesses symptoms of nervousness, restlessness and depressed affect (Kessler, 1996).
2. The General Health Questionnaire (GHQ), which was designed as a screening instrument to detect likely non-psychotic psychiatric "cases" in general health care settings (Goldberg & Williams, 1988). In the present analyses, both the categorical (screening positive as a likely case) and continuous methods of scoring the GHQ will be used.
3. As an indicator of general life satisfaction, participants were asked the following question: "How do you feel about your life as a whole, taking into account what has happened in the last year and what you expect to happen in the future?" Participants rated their view on a scale from 1 ("Delighted") to 7 ("Terrible") – referred to as the "Delighted-Terrible" scale.
4. The Short Form 12 (SF-12) was also included, which assesses possible limitations in both physical and mental health: the mental component summary (MCS) examines role limitations due to emotional and mental health problems (Ware, Kosinski, & Keller, 1996).

[1] Unpublished analyses; details can be obtained from the authors of this report.

2.1.4 DATA ANALYSIS

Those classified as having used alcohol were persons who reported drinking 12 or more standard drinks (each 10g alcohol) within the past 12 months. In some sections of the results, those who reported such alcohol use are divided into three groups: those who drank without meeting criteria for a use disorder, those who met criteria for alcohol abuse/harmful use without dependence, and those who met criteria for dependence. Hence, a four-level variable was created: no alcohol use in the past 12 months, alcohol use without meeting criteria for a DSM-IV disorder, meeting criteria for DSM-IV alcohol abuse, and meeting criteria for DSM-IV alcohol dependence.

Weighted estimates of the 12-month prevalence of DSM-IV alcohol use disorders are presented in this report. Estimates were weighted to conform to independent population estimates by State, part of State, age and sex. In addition, balanced repeated replicate weights were used to account for the complex survey sampling design. Prevalence estimates and their standard errors were calculated using SUDAAN Version 7.5.3 (Research Triangle Institute, 1997).

2.1.4.1 Multivariate analyses – predictors of alcohol involvement

To determine which were the significant demographic variables associated with the level of involvement with alcohol, a series of ordinal logistic regressions was carried out, with the alcohol involvement variable as the outcome variable. These were carried out using STATA 5.0 for Windows (STATA Corporation, 1997).

Ordinal logistic regression takes into account the natural ordering of the levels of an ordinal outcome variable (in this case, the level of involvement with alcohol according to DSM-IV alcohol use disorder status) (Bender & Grouven, 1997). While more common analytic methods such as logistic regression produce estimates of the size of the odds ratio for a dichotomous outcome variable, simply classifying an ordered scale into a dichotomous variable would mean losing information about the intervals along the scale. An alternative would be to carry out a series of logistic regressions in which the dichotomous outcome variable was classified according to the different cut-points of the scale. OLR produces an estimate of the average change in the odds for each additional point along the ordered scale (here, for each additional level of involvement with alcohol), which means that one odds ratio statistic can be used to summarise relationships between the level of alcohol involvement and the demographic characteristics examined.

Successive models were checked for changes in significance using the likelihood ratio test. The proportional odds assumption was tested for each significant predictor variable. The proportional odds assumption is that the size of the logit is similar between each cut point on the ordinal scale. This assumption can be tested by carrying out a series of logistic regressions in which a dichotomous variable reflecting different cut points on the ordinal scale are used. In the case of the alcohol involvement variable, there were 3 different cut-points: above and below a score of 1, 2 and 3. These came form a variable with four levels: no drinking (0) drinking without meeting criteria for a use disorder (1); meeting criteria for alcohol abuse (2); and alcohol dependence (3). Hence, for each significant predictor, three univariate logistic regressions were carried out, and the size of the logits for each of these regressions compared. The assumption of proportional odds was considered to

have been met if the 95% confidence intervals of the logits overlapped for all cut-points, which would mean that the average odds obtained in the OLR was an appropriate measure.

The proportional odds assumption was tested with each of the significant correlates. The tests revealed that this assumption was *not* met across all levels of the alcohol involvement variable. This was due entirely to the difference between non-drinkers and drinkers (of all types – without disorder, abusive and dependent). Tests revealed that the proportional odds assumption *was* met for the cut-points for three drinking groups (i.e. for all correlates tested, the 95% confidence intervals of the odds ratios overlapped for each of the cut points: drinking without disorder vs. any alcohol use disorder; and dependent vs. other drinkers).

Two multivariate analyses were conducted. The first was an examination of the correlates predictive of drinking (regardless of whether meeting criteria for an alcohol use disorder) compared to not drinking more than 12 drinks in the past 12 months. This was completed using multivariate logistic regression.

The second was an examination of the predictors of increased involvement with alcohol *among drinkers only* (n = 7746). This was completed using ordinal logistic regression. The outcome variable had three levels: drinking without meeting criteria for a use disorder (1); meeting criteria for alcohol abuse (2); and alcohol dependence (3). Those classified as non-drinkers were excluded from this analysis.

The variables entered into the models were: gender, age, marital status, educational attainment, employment status, and EPQ score. The significant predictors were retained in the model. The variable that weighted estimates to conform to independent population estimates by State, part of State, age and sex, was included in the model. The OR and 95%CI for each of the predictors were calculated. This provided an estimate of the average increase in odds of being one higher level up in the alcohol involvement variables for the predictor variable category compared to its reference category.

2.1.4.2 Multivariate analyses - comorbidity

Multivariate logistic regressions were carried out for each dichotomous outcome variable (e.g. presence/absence of a DSM-IV affective disorder). All analyses were carried out using STATA 5.0 for Windows (STATA Corporation, 1997). In these analyses, the following steps were carried out:

1. A univariate logistic regression in which only the alcohol involvement variable was included. Alcohol involvement was dummy coded with each level of alcohol involvement (drinking without disorder, DSM-IV abuse, DSM-IV dependence) all compared against non-drinkers as the reference category.

This was followed by a series of multivariate logistic regression analyses in which the following sets of variables were added in the regression model at each subsequent step:

2. Demographic variables:
   a. Gender (reference category: female);
   b. Age (reference category: 18-24 years, compared to 25-34, 35-44, 45-54, 55+);

c. Education (reference category: completed less than secondary education, compared to completed secondary education, completed post-secondary education);
d. Marital status (reference category: currently married; compared to separated, divorced, widowed, de facto, never married);
e. Employment status (reference category: employed full-time; compared to employed part-time, unemployed, not in the labour force).

3. EPQ Neuroticism score.

4. Other drug use. This was coded in the following manner:
   a. Regular (daily) tobacco use (reference category no regular use);
   b. Cannabis use in the past 12 months (reference category: no use);
   c. Other drug use (stimulant, sedative or opiate use) in the past 12 months (reference category: no use).

Note that when a drug use variable was the outcome variable (e.g. presence or absence of a DSM-IV cannabis use disorder) the related drug use predictor was not included in the analysis (i.e. cannabis use was not included in the analysis when a DSM-IV cannabis use disorder was the outcome variable).

For linear outcome variables (e.g. score on the GHQ) the same analysis procedure was used, with linear regression rather than logistic regression.

2.1.4.3 Analysis of the DSM-IV dependence syndrome

The structure of DSM-IV alcohol dependence symptoms among alcohol users was examined using Principal Components Analysis (PCA). PCA reduces the dependence criteria to a linear combination (a "component") that maximises the amount of variance of the criteria that is explained by the combination. Only those components which had an eigenvalue of greater than 1 (the amount of variance explained each of the original variables) were retained. Since the dependence criteria were dichotomous (presence or absence of the symptom), tetrachoric correlations were calculated, and the matrices used in SYSTAT version 6 (SYSTAT, 1994a; SYSTAT, 1994b). The internal consistency of ICD-10 and DSM-IV alcohol dependence were also calculated in SPSS Version 9.0 using Cronbach's Alpha. A value of 0.7 or greater was taken to indicate unidimensionality (Streiner & Norman, 1995).

2.1.4.4 Agreement between DSM-IV and ICD-10 diagnostic systems

Agreement between DSM-IV and ICD-10 diagnoses among alcohol users was calculated using Cohen's Kappa; this was carried out for both abuse/harmful use and dependence. Feinstein has suggested that Kappa values of 0-0.2 indicate slight agreement, values of 0.21-0.40 indicate fair agreement, 0.41-0.6 indicate moderate agreement, 0.61-0.80 indicate substantial agreement, and 0.81-1.0 indicate almost perfect agreement (Feinstein, 1985). Pearson correlations were calculated for agreement on the severity of dependence (number of symptoms met) between DSM-IV and ICD-10 systems, among alcohol users.

3 RESULTS

Approximately one quarter of persons (26.5%) had not consumed 12 or more standard drinks of alcohol in the past year; two thirds (68%) had used alcohol without meeting criteria for a DSM-IV use disorder, while 1.9% met criteria for alcohol abuse and 4.1% met criteria for dependence (Table 1). Males were more likely than females to report having used alcohol in the past year, and were more likely to meet criteria for alcohol abuse (2.9% vs. 0.9%) and dependence (6.1% vs. 2.3%; $\chi^2_{(3df)} = 585.9$, $p<.00001$).

Table 1: Prevalence of alcohol use, DSM-IV abuse and dependence, by demographic characteristics

	No alcohol use	Alcohol use without disorder	Alcohol Abuse	Alcohol dependence
	% (SE)	% (SE)	% (SE)	% (SE)
Prevalence (population N)	26.5 (0.5) (3,562,000)	67.5 (0.6) (9,089,000)	1.9 (0.2) (256,000)	4.1 (0.3) (558,000)
Female	36.1 (0.7)	60.7 (0.8)	0.9 (0.1)	2.3 (0.3)
Male	16.6 (0.7)	74.4 (1.2)	2.9 (0.3)	6.1 (0.8)
Age group				
18-24	20.4 (1.7)	65.1 (1.9)	5.2 (0.8)	9.3 (1.9)
25-34	21.2 (1.0)	70.7 (1.1)	2.4 (0.4)	5.7 (0.6)
35-44	23.4 (1.0)	70.6 (0.9)	1.9 (0.6)	4.0 (0.4)
45-54	24.2 (3.5)	71.7 (3.4)	1.1 (0.6)	3.0 (0.6)
55-64	31.7 (2.2)	66.3 (2.2)	0.3 (0.2)	1.7 (0.4)
65-74	35.2 (1.5)	63.7 (1.6)	0.3 (0.2)	0.8 (0.3)
75+	52.2 (4.2)	47.0 (4.2)	0.1 (0.1)	0.7 (0.4)
Education				
Less than secondary	34.9 (0.9)	59.5 (0.8)	2.0 (0.5)	3.6 (0.5)
Secondary	26.7 (1.3)	65.4 (3.2)	2.6 (1.0)	5.3 (1.5)
Post-secondary	20.8 (0.6)	73.4 (0.7)	1.6 (0.2)	4.2 (0.3)
Employment status				
Employed full-time	15.6 (1.2)	76.6 (0.9)	2.7 (0.4)	5.1 (0.8)
Employed part-time	25.7 (2.6)	69.1 (1.9)	1.2 (0.3)	4.0 (0.9)
Unemployed	27.7 (3.0)	57.5 (3.1)	4.6 (1.0)	10.2 (2.7)
Not in labour force	41.9 (1.2)	55.2 (1.2)	0.8 (0.3)	2.2 (0.3)
Marital status				
Widowed	55.0 (2.3)	43.5 (2.1)	0.4 (0.3)	1.1 (0.5)
Married/de facto	25.7 (0.5)	70.5 (0.5)	1.2 (0.2)	2.5 (0.2)
Separated/divorced	28.9 (1.6)	63.4 (1.5)	1.9 (0.8)	5.8 (1.0)
Never married	20.2 (1.4)	66.2 (1.8)	4.3 (0.6)	9.3 (1.5)
EPQ score (M)	2.7 (0.05)	2.4 (0.03)	3.3 (0.20)	4.7 (0.15)

There was also a pronounced age-related pattern of involvement with alcohol. Those aged 18-24 years were most likely to meet criteria for alcohol abuse or dependence (5.2% and 9.3% respectively), with the prevalence decreasing among older groups, such that only 0.8% of those aged 75 years and over met criteria for alcohol abuse or dependence ($\chi^2_{(6df)}$= 435.3, p<.00001).

Persons who had completed secondary education or higher were more likely to meet criteria for DSM-IV alcohol dependence within the past 12 months, while those with less than secondary education were most likely to report no alcohol use within the past year ($\chi^2_{(6df)}$= 252.9, p<.0001). This finding is likely to have been confounded by age, as older persons would have been less likely to have completed further education than younger persons.

The unemployed were much more likely to meet criteria for alcohol dependence (10.2%) or abuse (4.6%) within the past year than those who were employed or not in the labour force. Those who were employed or not in the labour force were more likely to report alcohol use without meeting criteria for a use disorder ($\chi^2_{(6f)}$= 73.7, p<.00001).

Marital status was strongly associated with the extent of involvement with alcohol use ($\chi^2_{(9df)}$= 630.4, p<.00001). Those who had never married were most likely to meet criteria for alcohol abuse (4.3%) or dependence (9.3%). Those who were widowed were most likely to report no alcohol use within the past 12 months (55%); while those who were currently married or in a de facto relationship were more likely to report alcohol use without meeting criteria for a use disorder (Table 1).

3.1 PATTERNS OF ALCOHOL USE

When asked about the typical number of drinks consumed on a drinking day, the majority of males and females reported 1 to 3 drinks was the average (67% and 82% respectively). One quarter of males reported drinking 4 to 8 drinks on a typical drinking day, compared to only 15% of females (Table 2). Around one quarter of persons reported drinking each of the following: every day (27%), 1 to 3 days per month (24%), and 1 to 2 days per week (24%). Around 3 in 10 males reported drinking every day, compared to 2 in 10 females (Table 2). Most drinkers had begun drinking at their typical frequency and quantity more than one year ago (94.5%; SE = 0.4), and three quarters had done so within the past two weeks (73%).

Males were more likely than females to report drinking greater quantities of alcohol on their heaviest drinking session ($\chi^2_{(24df)}$= 1339.2, p<.00001). Approximately 2 in 5 males reported drinking between 9 to 12 drinks (22%) or between 13-20 drinks (21%), with a further 9% reporting more than 20 drinks in their heaviest drinking session. In comparison, half of females (49%) reported that in their most heavy session, they consumed 1 to 3 drinks, with a further one third reporting 4 to 8 drinks (35%).

Table 2: Patterns of alcohol use among drinkers according to gender

	Females % (SE)	Males % (SE)	Persons % (SE)
Typical number of drinks per day			
1-3 drinks	82.1 (0.7)	66.3 (1.3)	73.3 (0.8)
4-8 drinks	15.0 (0.6)	24.9 (0.8)	20.5 (0.6)
9-12 drinks	2.2 (0.3)	6.2 (1.0)	4.4 (0.5)
13-20 drinks	0.5 (0.1)	1.6 (0.3)	1.1 (0.2)
21 or more	0.3 (0.1)	0.8 (0.2)	0.6 (0.1)
Typical frequency of alcohol use			
Less than once a month	10.8 (0.9)	6.0 (0.6)	8.1 (0.5)
1-3 days per month	29.3 (0.9)	20.5 (0.8)	24.3 (0.6)
1-2 days per month	24.4 (0.8)	24.3 (0.7)	24.3 (0.5)
3-4 days per week	14.4 (0.6)	18.2 (1.3)	16.5 (0.7)
every day	21.1 (1.2)	31.1 (1.0)	26.8 (0.5)
Most drinks on a single day			
1-3 drinks	48.5 (1.3)	25.4 (1.0)	35.6 (0.8)
4-8 drinks	35.4 (1.2)	31.6 (1.2)	33.3 (0.6)
9-12 drinks	10.9 (0.5)	21.5 (0.9)	16.8 (0.6)
13-20 drinks	3.2 (0.3)	12.3 (0.8)	8.3 (0.5)
21 or more	2.0 (0.2)	9.2 (0.4)	6.0 (0.2)
Recency of typical frequency & no. of drinks*			
Within past 2 weeks	69.7 (1.4)	74.8 (1.5)	72.5 (1.3)
2 weeks - 1 month ago	13.0 (1.1)	12.3 (1.8)	12.6 (1.4)
1 month – 6 months ago	13.2 (0.8)	10.0 (0.5)	11.4 (0.5)
6 months – 1 year ago	2.9 (0.3)	1.9 (0.3)	2.4 (0.2)
in last 12 months	0.7 (0.2)	0.3 (0.1)	0.5 (0.1)

* Some missing data – n = 50 persons reported recency of typical frequency and amount of use as more than 1 year ago

As might be expected, drinking patterns differed markedly according to involvement with alcohol use (Table 3). Almost all drinkers who did not meet criteria for a DSM-IV use disorder reported that their typical number of drinks was 1 to 3 (77%) or 4 to 8 (18%) on a drinking day. Those who met criteria for alcohol abuse were those most likely to report heavier consumption on a drinking day, with 1 in 5 reporting 9 to 12 drinks was their standard amount, and half reporting 4 to 8 drinks was typical for them. Those who met criteria for dependence were most likely to report drinking between 4 to 8 drinks (39%) or 1 to 3 drinks (36%) on a typical drinking day.

Table 3: Patterns of alcohol use according to alcohol involvement (non-disordered use, abuse or dependence)

	Use without disorder % (SE)	Abuse % (SE)	Dependence % (SE)
Typical no. of drinks per day			
1-3 drinks	77.0 (0.8)	22.5 (3.2)	35.7 (3.3)
4-8 drinks	18.5 (0.6)	50.3 (3.9)	39.5 (3.8)
9-12 drinks	3.4 (0.5)	21.1 (3.6)	14.4 (2.7)
13-20 drinks	0.8 (0.1)	4.7 (1.8)	4.9 (1.1)
21 or more	0.2 (0.08)	1.5 (1.5)	5.5 (1.7)
Typical frequency of use			
Less than once a month	8.7 (0.6)	2.3 (1.3)	0.9 (0.5)
1-3 days per month	25.6 (0.7)	16.1 (4.2)	7.3 (5.1)
1-2 days per month	24.4 (0.6)	30.0 (4.9)	20.2 (2.7)
3-4 days per week	16.0 (0.6)	19.1 (3.7)	24.1 (3.9)
every day	25.3 (0.5)	32.5 (4.7)	47.5 (2.5)
Most drinks on a single day			
1-3 drinks	38.8 (0.9)	-	-
4-8 drinks	34.8 (0.7)	14.0 (3.2)	16.3 (3.8)
9-12 drinks	15.5 (0.6)	35.6 (5.0)	29.8 (5.3)
13-20 drinks	6.7 (0.4)	26.2 (5.2)	25.7 (2.9)
21 or more	4.1 (0.3)	24.2 (3.3)	28.2 (2.1)
Recency of typical frequency & no. of drinks*			
Within past 2 weeks	72.2 (1.0)	73.8 (4.4)	78.1 (6.6)
2 weeks - 1 month ago	12.7 (1.0)	14.0 (4.3)	9.2 (7.3)
1 month – 6 months ago	11.6 (0.5)	10.2 (2.6)	9.1 (2.4)
6 months – 1 year ago	2.4 (0.2)	1.4 (0.8)	2.4 (0.8)
in last 12 months	0.5 (0.1)	-	0.6 (0.4)

* Some missing data – n = 50 persons reported recency of typical use as more than 12 months ago

While those meeting criteria for alcohol abuse reported greater average alcohol consumption than those who were alcohol dependent, the latter reported more frequent use of alcohol. Almost half of dependent persons (48%) reported daily alcohol use, compared to one third of those meeting criteria for abuse (33%). Similar proportions of both groups reported use between 1 to 4 days per week (49% for abuse, 44% for dependence). For most persons (around 93%) typical use patterns had begun more than one year ago, and this was independent of their level of involvement with alcohol.

Those meeting criteria for alcohol abuse or dependence were much more likely to report drinking larger amounts of alcohol on their heaviest drinking session than drinkers who did not meet criteria for a use disorder.

3.2 MULTIVARIATE ANALYSIS OF CORRELATES OF ALCOHOL INVOLVEMENT

As outlined in the method section, a series of ordinal logistic regressions (OLR) was conducted to examine the significant predictors of increased involvement with alcohol. OLR takes into account the ordering of an ordered categorical outcome variable (in this case, the level of involvement with alcohol). It estimates the average change in the odds ratio that is associated with successively higher cut-points on the ordered variable (i.e. for each additional level of involvement). This means that it is possible to use one odds ratio statistic to represent the average over all cut-points in the scale, as opposed to having a different odds ratio for each separate cut-point.

3.2.1 PREDICTING ALCOHOL USE

The proportional odds assumption was *not* met across all the cut-points along the alcohol involvement variable, with the patterns of difference for non-drinkers compared to drinkers (regardless of their DSM-IV alcohol use disorder status) being significantly different compared to the other odds ratios. Hence, two analyses are reported here. The first is a multivariate logistic regression, which compares non-drinkers with drinkers (regardless of their level of involvement with alcohol according to DSM-IV diagnoses). The final logistic regression model ($\chi^2_{13\ df}$ = 1195.24, p <.0001, pseudo R^2 = 0.10) is shown in Table 4.

Table 4: Results of logistic regression of the significant correlates of reporting alcohol use within the past year (n = 10,641)

	OR	95%CI
Male[1]	2.39	2.15, 2.65
Aged 25-34[2]	0.81	0.66, 0.98
Aged 35-44[2]	0.74	0.61, 0.90
Aged 45-54[2]	0.69	0.57, 0.84
Aged 55+[2]	0.70	0.57, 0.85
Completed secondary education[3]	1.18	1.02, 1.35
Completed post-secondary education[3]	1.42	1.29, 1.58
De facto[4]	1.43	1.14, 1.79
Widowed[4]	0.57	0.48, 0.67
Employed part-time[5]	0.80	0.70, 0.92
Unemployed[5]	0.54	0.43, 0.68
Not in the labour force[5]	0.42	0.37, 0.47

1. Reference category: female
2. Reference category: aged 18-24 years
3. Reference category: did not complete secondary education
4. Reference category: currently married
5. Reference category: employed full time

The multivariate logistic regression revealed that when considering other demographic factors, males were more than twice as likely than females to report drinking alcohol during the past year (OR = 2.4). The 18 to 24 year age group was most likely to report alcohol use, compared to all other age groups. Those who had completed secondary (OR = 1.2) and postsecondary education (OR = 1.4) were also more likely to report alcohol use than those who had not completed secondary schooling.

Marital status was also a significant predictor in the final model, with those who were in a de facto relationship more likely to report alcohol use (OR = 1.4), and those who had been widowed being significantly less likely to report alcohol use (OR = 0.6) compared to those who were married. There were no significant differences between those who were married and those who were divorced or who had never been married, in the likelihood of reporting alcohol use within the past year (these variables were not retained in the final model as they were not significant).

Employment status also remained a significant predictor of alcohol use in the past year, with those who were employed on a full-time basis the most likely to report any alcohol use, compared to those who were employed part-time (OR = 0.8), those who were unemployed (OR = 0.5), and those who were not in the labour force (OR = 0.4).

3.2.2 PREDICTING LEVEL OF INVOLVEMENT AMONG DRINKERS

The size of the odds ratios *was* similar across levels of involvement with alcohol (drinking without meeting criteria for a use disorder vs. meeting criteria for alcohol abuse vs. meeting criteria for dependence). Hence, it was appropriate to use multivariate ordinal logistic regression to examine the correlates of increasing involvement with alcohol *only among drinkers*. The final ordinal logistic regression model ($\chi^2_{11\ df} = 712.03$, $p < .0001$, pseudo $R^2 = 0.14$) is shown in Table 5.

Again, gender remained a significant predictor. Males were significantly more likely to report greater involvement with alcohol – i.e. to meet criteria for abuse or dependence – than females. Age was also a significant predictor: being aged 45 years and over significantly reduced the likelihood of heavier involvement with alcohol. There were no significant differences among drinkers from the 18-24, 25-34 and 35-44 year age groups. This means that while those aged 18 to 24 years were most likely to report any alcohol use (Table 4), those drinkers aged between 18 and 44 did not differ significantly in the likelihood that such use would be more problematic. In comparison, those aged over 45 years were less likely to report any use, and less likely to report more problematic use if they did drink.

Among drinkers, marital status also remained a significant correlate of increased involvement with alcohol. Drinkers who were divorced, separated, in a de facto relationship or who had never been married were significantly more likely than those who were currently married to be more heavily involved with alcohol according to DSM-IV alcohol use disorder status. Comparison with the first analysis (Table 4) reveals that while the likelihood of *any* alcohol use did not differ according to whether or not persons were married, had never been married, were divorced or separated; being an unmarried, divorced or separated drinker meant that such use was more likely to be *problematic*. There was no difference between drinkers who were married and drinkers who had been widowed in their likelihood of being more heavily involved with alcohol use.

Table 5: Results of ordinal logistic regression of the significant correlates of increased involvement with alcohol use among alcohol users (n = 7,746)

	OR	95%CI
Male[1]	4.76	2.36, 3.49
Aged 45-54[2]	0.61	0.47, 0.80
Aged 55+[2]	0.26	0.19, 0.38
Never married[3]	2.97	2.39, 3.69
Divorced[3]	2.54	1.84, 3.51
Separated[3]	2.30	1.57, 3.38
Defacto[3]	2.76	2.03, 3.77
Unemployed[4]	1.95	1.43, 2.66
Not in the labour force[4]	1.28	1.07, 1.75
EPQ score	1.27	1.24, 1.31

1. Reference category: female
2. Reference category: aged 18-24 years
3. Reference category: currently married
4. Reference category: employed full time

Furthermore, employment status remained a significant predictor of alcohol involvement. Being unemployed or not in the labour force increased the likelihood that a drinker would be more heavily involved with alcohol use, compared to being employed on a full-time basis. There was no significant difference between those who were employed on a part-time or full-time basis. Hence, while those who were unemployed or not in the labour force were less likely to be drinkers (Table 4), those who *were* drinkers were more likely to have problematic alcohol use (Table 5).

Finally, scores on the Neuroticism scale of the EPQ remained significant predictors of alcohol involvement. Those drinkers who had higher scores on the EPQ were more likely to report more problematic alcohol use.

3.3 COMORBIDITY

3.3.1 OTHER SUBSTANCE USE AND DSM-IV SUBSTANCE USE DISORDERS

Those who did not drink alcohol were least likely to report the use of other drug types in the past year. This applied to regular tobacco use, cannabis use, and illicit drug use (Table 6, 7). Among those who drank alcohol without meeting criteria for a use disorder, one quarter (24%) were regular tobacco users, 7% reported cannabis use, and 3% reported using other drugs. These proportions increased among those who were dependent, half of whom (51%) were regular tobacco users, one third (31%) of whom were cannabis users, and 15% of whom reported using other drugs more than five times in the past year (Table 6, 7).

These significant associations were also observed in the prevalence of DSM-IV cannabis and other drug use disorders (Table 7). Around 1 in 100 non-drinkers met criteria for a cannabis use disorder, with less than one percent meeting criteria for another drug use disorder. These proportions increased as involvement with alcohol increased, so that one in 7 (15%) alcohol dependent persons met criteria for a cannabis use disorder (OR = 19.3 compared to non-drinkers), and 1 in 14 met criteria for a sedative, stimulant or opiate use disorder (OR = 10.0; Table 7).

Table 6: Prevalence (%) of substance use and DSM-IV substance use disorders according to alcohol involvement

	No alcohol use % (SE)	Alcohol use without disorder % (SE)	Alcohol abuse % (SE)	Alcohol dependence % (SE)
Regular tobacco use	15.3 (0.9)	23.9 (0.6)	48.7 (8.6)	51.0 (4.0)
Cannabis use	1.9 (0.5)	7.1 (0.4)	27.3 (7.7)	31.5 (2.9)
DSM-IV cannabis use disorder	0.9 (0.2)	1.8 (0.2)	10.6 (3.6)	15.3 (2.7)
Sedative, stimulant or opiate use	2.8 (0.4)	3.0 (0.4)	10.9 (2.8)	15.3 (3.2)
DSM-IV sedative, stimulant or opiate use disorder	0.7 (0.3)	0.6 (0.1)	2.2 (1.3)	7.3 (2.3)

The *conditional prevalence* of substance use disorders among users was also examined. This is one way to examine the liability of people towards problematic substance use. It indicates what proportion of persons who report *any* use of a substance also report *problematic* use of that substance.

The conditional prevalence of drug use disorders increased as involvement with alcohol use increased. For example, almost half (49%) of alcohol dependent persons who used cannabis met criteria for a cannabis use disorder, compared to one quarter (25%) of alcohol users who had used cannabis. Estimates were not made of this relationship for non-drinkers due to the small size of the estimates, and the large amount of error associated with the estimates.

Table 7 also shows the odds ratios and their 95% confidence intervals produced after the final multivariate logistic regression. These "adjusted" odds ratios control for the effects of demographic variables (age, gender, education, marital status, employment status), EPQ neuroticism score, and the use of other drugs. Appendix B shows additional statistics from these analyses.

Clearly, those who used alcohol were more likely than those who did not to also report using other drug types, even after adjusting for these variables. Regular tobacco use was significantly more common among all drinkers than non-drinkers. Furthermore, those with more problematic alcohol use (who met criteria for DSM-IV abuse or dependence) were more likely to report regular tobacco use than drinkers who did not meet criteria for a disorder, as shown by the fact that the 95% confidence intervals for the adjusted odds ratios do not overlap (Table 7).

Table 7: Univariate and adjusted odds ratios (OR) and 95% confidence intervals (95%CI) for drug use according to alcohol use

	OR[1]	95%CI	Adjusted OR[1]	Adjusted 95%CI
Regular tobacco use				
Alcohol use	1.72	1.54, 1.92	1.70	1.50, 1.92
Alcohol abuse	5.31	3.95, 7.24	3.00	2.17, 4.18
Alcohol dependence	5.75	4.66, 7.10	3.09	2.44, 3.94
Cannabis use				
Alcohol use	3.61	2.73, 4.76	2.54	1.89, 3.44
Alcohol abuse	17.57	11.53, 26.76	4.48	2.80, 7.17
Alcohol dependence	22.20	15.96, 30.88	5.35	3.69, 7.77
Cannabis use disorder				
Alcohol use	1.87	1.22, 2.86	1.20	0.76, 1.92
Alcohol abuse	11.22	5.97, 21.11	1.98	0.98, 3.98
Alcohol dependence	19.28	12.06, 30.88	3.35	1.98, 5.70
Other drug use				
Alcohol use	1.23	0.94, 1.60	1.26	0.95, 1.68
Alcohol abuse	4.13	2.41, 7.10	2.52	1.40, 4.54
Alcohol dependence	7.26	5.15, 10.26	3.03	2.04, 4.48
Other drug use disorder				
Alcohol use	0.74	0.44, 1.24	0.70	0.40, 1.24
Alcohol abuse	2.90	1.00, 8.50	1.05	0.34, 3.31
Alcohol dependence	9.96	5.70, 17.37	2.50	1.31, 4.79

1. All odds ratios use "no alcohol use" group as the reference category

Cannabis use in the past 12 months also remained significantly more common in drinkers than non-drinkers (Table 7). The adjusted odds ratios increased among those with more problematic alcohol

use (adjusted OR = 2.5 for drinkers; OR = 4.5 for abuse; OR = 5.4 for dependence), but the 95% confidence intervals overlapped. Those who met criteria for alcohol dependence remained significantly more likely than non-drinkers to meet criteria for a cannabis use disorder (adjusted OR = 3.4).

The use of sedatives, stimulants or opiates within the past year also remained more likely among those who met criteria for DSM-IV alcohol abuse (adjusted OR = 2.5) or dependence (adjusted OR = 3.0). Those who met criteria for DSM-IV alcohol dependence remained more likely than non-drinkers to meet criteria for another drug use disorder.

3.3.2 MENTAL HEALTH

DSM-IV affective and anxiety disorders

Table 8 shows the prevalence of mental disorders by level of involvement with alcohol, and Table 9 shows the univariate odds ratios of having an affective or anxiety disorder, with non-drinkers as the reference group. The prevalence of anxiety disorders was significantly lower for those who drank without having a use disorder (4.5%) than it was among those who did not drink alcohol (6.5%; OR = 0.8). This was also the case for affective disorders, with 7.3% of non-drinkers meeting criteria for an affective disorder, compared to 5.5% of those who drank without having a use disorder (OR = 0.8). Those who met criteria for DSM-IV alcohol abuse did not differ significantly from non-drinkers in the prevalence of either anxiety disorders or affective disorders (Table 8, 9).

Table 8: Prevalence (%) of DSM-IV anxiety and affective disorders according to alcohol involvement

	No alcohol use	Alcohol use without disorder	Alcohol abuse	Alcohol dependence
	% (SE)	% (SE)	% (SE)	% (SE)
DSM-IV anxiety disorder	6.5 (0.5)	4.5 (0.4)	4.9 (1.9)	19.5 (2.7)
DSM-IV affective disorder	7.3 (0.4)	5.5 (0.3)	6.1 (2.0)	24.0 (4.0)

The pattern was distinctly different for persons meeting criteria for DSM-IV alcohol dependence: around one in five (20%) also met criteria for an anxiety disorder, while one in four (24%) also had an affective disorder. Persons meeting criteria for DSM-IV alcohol dependence were 4.5 times more likely than non-drinkers (OR = 4.5; 95%CI: 3.5, 5.7) to have an anxiety disorder, and 4.4 times more likely than non drinkers to have an affective disorder (OR = 4.4; 3.4, 5.8).

These patterns in the prevalence of anxiety and affective disorders hence can be seen to form a curve in which those at the "extremities" of involvement in alcohol use, the "no use" and "dependent use" groups, had higher rates of anxiety and affective disorders than those with "intermediate" levels of involvement.

Table 9: Univariate and adjusted odds ratios (OR) and 95% confidence intervals (95%CI) of DSM-IV affective and anxiety disorders according to alcohol use

	OR[1]	95%CI	Adjusted OR[1]	Adjusted 95%CI
DSM-IV affective disorder				
Alcohol use	0.82	0.70, 0.97	0.96	0.79, 1.16
Alcohol abuse	0.90	0.50, 1.60	0.61	0.32, 1.16
Alcohol dependence	4.47	3.48, 5.74	1.95	1.42, 2.68
DSM-IV anxiety disorder				
Alcohol use	0.78	0.65, 0.93	0.98	0.79, 1.22
Alcohol abuse	0.73	0.37, 1.44	0.47	0.22, 0.99
Alcohol dependence	4.42	3.39, 5.75	1.78	1.26, 2.52

1. All odds ratios use "no alcohol use" group as the reference category

The adjusted odds ratios produced after controlling for demographics, neuroticism and other drug use are also displayed in Table 9. After adjusting for these other factors, there were no differences between non-drinkers and drinkers, or between non-drinkers and those who met criteria for DSM-IV alcohol abuse. In contrast, persons meeting criteria for DSM-IV alcohol dependence were still significantly more likely than non-drinkers to meet criteria for an affective disorder (OR = 2.0) or an anxiety disorder (OR = 1.8). They were also more likely than drinkers who did not meet criteria for a use disorder, and those who met criteria for alcohol abuse, to have such disorders (as estimated from the 95% confidence intervals of the odds ratios).

3.3.2.1 Other measures of mental health

Table 10 shows the pattern of mean scores on a range of other symptom measures of mental health and well-being: the GHQ, Kessler's Psychological Distress scale, the SF-12 and the Delighted-Terrible scale (satisfaction with life as a whole).

Table 10: Mean scores on other measures of mental health

	No alcohol use	Alcohol use without disorder	Alcohol abuse	Alcohol dependence
	M (SE)	M (SE)	M (SE)	M (SE)
GHQ	1.1 (0.04)	0.8 (0.02)	0.9 (0.14)	1.8 (0.15)
Delighted-Terrible	2.9 (0.02)	2.7 (0.01)	2.9 (0.08)	3.3 (0.06)
Kessler's PD	45.5 (0.11)	46.2 (0.05)	45.2 (0.38)	41.5 (0.37)
SF-12	51.6 (0.19)	52.5 (0.10)	51.0 (0.70)	45.9 (0.57)

Those who did not drink alcohol had significantly higher scores on the GHQ than those who drank it without meeting criteria for an alcohol use disorder (M = 1.1 vs. M = 0.8; Table 11), indicating that non-drinkers reported greater disturbance in their ability to fulfil role requirements than drinkers (Table 12). The same univariate pattern existed for all other measures of psychological distress, with unproblematic drinkers reporting lower levels of psychological distress and greater life satisfaction (Table 11, 12).

There were no significant univariate differences between non-drinkers and those who met criteria for DSM-IV alcohol abuse on any of these measures of psychological distress and life satisfaction (Table 11, 12).

Those who met criteria for DSM-IV alcohol dependence reported significantly greater levels of psychological distress and lower life satisfaction on all measures considered here (Table 11, 12).

Table 11: Results of univariate linear regression of alcohol use on measures of mental health and well-being

	Standardised beta coefficient[1]	Regression coefficient[1]	95%CI	t (sig)
GHQ				
Alcohol use	-0.05	-0.21	-0.29, -0.12	-4.78 (<.001)
Alcohol abuse	-0.01	-0.13	-0.42, 0.16	ns
Alcohol dependence	0.10	0.98	0.78, 1.18	9.69 (<.001)
Delighted-terrible				
Alcohol use	-0.07	-0.17	-0.22, -0.12	-6.95 (<.001)
Alcohol abuse	0.01	0.07	-0.10, 0.23	ns
Alcohol dependence	0.10	0.54	0.43, 0.65	9.50 (<.001)
Kessler's PD				
Alcohol use	0.05	0.58	0.36, 0.80	5.12 (<.001)
Alcohol abuse	-0.01	-0.29	-1.06, 0.47	ns
Alcohol dependence	-0.16	-4.34	-4.86, -3.83	-16.45 (<.001)
SF-12				
Alcohol use	0.03	0.53	0.13, 0.93	2.60 (<.01)
Alcohol abuse	-0.01	-0.92	-2.31, 0.46	ns
Alcohol dependence	-0.14	-6.67	-7.61, -5.74	-13.97 (<.001)

1. All coefficients are estimates of the change from "no alcohol use" group as the reference category

Multivariate analyses

Table 12 shows the results of the multivariate linear regressions, which took into consideration demographic variables, neuroticism, and other drug use. Three patterns emerged. First, the differences between non-drinkers and unproblematic drinkers largely disappeared after taking into

account the other variables. This was in large part due to the fact that non-drinkers had higher scores on the neuroticism scale, and when this was taken into account, the differences between drinkers and non-drinkers did not remain. Hence, after taking into account other factors, non-drinkers and drinkers who did not meet criteria for an alcohol use disorder did not differ on any of these measures of mental health and well-being.

Second, while there were no significant univariate differences between non-drinkers and those who met criteria for DSM-IV alcohol abuse on any of these measures of mental health and well-being (see Table 11), there *were* significant differences after the multivariate analysis was completed (Table 12). For Kessler's psychological distress scale and the GHQ, this was again largely due to the fact that non-drinkers had higher scores on the EPQ neuroticism scale. When other factors were taken into account, persons meeting criteria for DSM-IV alcohol abuse reported *lower* levels of psychological distress than non-drinkers, as assessed by the GHQ, the SF-12, and Kessler's Psychological Distress scale (Table 12).

Table 12: Results of multivariate linear regression of alcohol use on measures of mental health and well-being

	Standardised beta coefficient[1]	Regression coefficient[1]	95%CI	t (sig)
GHQ				
Alcohol use	-0.03	-0.12	-0.20, -0.03	-2.75 (<.01)
Alcohol abuse	-0.03	-0.40	-0.67, -0.12	-2.82 (<.01)
Alcohol dependence	0.02	0.21	0.01, 0.40	2.08 (<.05)
Delighted-terrible				
Alcohol use	-0.03	-0.06	-0.11, -0.02	-2.77 (<.01)
Alcohol abuse	-0.005	-0.05	-0.20, 0.10	ns
Alcohol dependence	0.02	0.11	0.01, 0.22	2.13 (<.05)
Kessler's PD				
Alcohol use	0.01	0.16	-0.02, 0.33	ns
Alcohol abuse	0.02	0.94	0.35, 1.54	3.10 (<.005)
Alcohol dependence	-0.04	-1.11	-1.52, 0.69	-5.19 (<.001)
SF-12				
Alcohol use	0.015	0.31	-0.05, 0.67	ns
Alcohol abuse	0.02	1.40	0.21, 2.59	2.30 (<.05)
Alcohol dependence	-0.03	-1.32	-2.16, -0.48	-3.10 (<.005)

1. All coefficients are estimates of the change from "no alcohol use" group as the reference category

Third, the differences between non-drinkers and those meeting criteria for DSM-IV alcohol dependence remained after taking account of other factors considered in these multivariate analyses. Persons who were alcohol dependent reported significantly higher levels of psychological distress and lower life satisfaction after taking into account the use of other drug types, neuroticism, and

demographic variables that may have mediated the relationship.

3.3.2.2 Psychosis

The proportion of persons who screened positively for psychosis was also examined. Approximately 0.74% (SE = 0.16) of non-drinkers screened positively, with 0.78% of drinkers (SE = 0.14) and 1.84% of persons who met criteria for DSM-IV alcohol abuse (SE = 1.25) screening positively. There were no differences between these groups in the prevalence of "cases" on either a univariate level or after conducting multivariate analyses (Table 13). Persons who met criteria for DSM-IV alcohol dependence were 6.4 times more likely than non-drinkers to screen positively for psychosis, with 4.27% doing so (SE = 1.28). This significant relationship did not remain after controlling for demographics, neuroticism and other drug use (Table 13), but the width of the confidence interval suggests that a relationship cannot be excluded.

Table 13: Odds ratios (OR) and confidence intervals (95%CI) of screening positively for psychosis according to alcohol use

	OR[1]	95%CI
Psychosis screen + (univariate)		
Alcohol use	1.06	0.67, 1.68
Alcohol abuse	2.55	0.88, 7.39
Alcohol dependence	6.37	3.59, 11.34
Psychosis screen + (adjusted)		
Alcohol use	1.18	0.72, 1.95
Alcohol abuse	1.38	0.45, 4.26
Alcohol dependence	1.67	0.86, 3.22

1. All odds ratios use "no alcohol use" group as the reference category

3.4 DSM-IV ALCOHOL DEPENDENCE

3.4.1 DEPENDENCE SYMPTOMS

Table 14 shows the weighted prevalence of each dependence symptom according to gender, and according to alcohol dependence status. In the general population, around 15% of alcohol drinkers reported having used alcohol for longer than intended, or in greater amounts than intended, during the past year (Table 14); this was more common among male drinkers than female drinkers (OR = 1.65; 95%CI: 1.45, 1.88). Around 12% of drinkers reported having a persistent desire for alcohol use (with male drinkers more likely to report this symptom; OR = 1.88, 95%CI: 1.63, 2.17), and 10%

reported experiencing tolerance to the effects of alcohol (again with more male drinkers reporting this symptom; OR = 1.72; 95%CI: 1.47, 2.01). Much smaller proportions of drinkers reported the other dependence criteria.

Table 14: Weighted prevalence (%) of DSM-IV dependence symptoms among alcohol users by gender

	Female	Male	Non-dependent	Dependent	Total
1. Tolerance	7.4 (0.6)	12.2 (0.6)	6.4 (0.8)	71.8 (2.6)	10.1 (0.5)
2. Withdrawal/use to avoid withdrawal	2.0 (0.3)	4.4 (0.5)	0.9 (0.2)	43.2 (3.2)	3.3 (0.3)
3. Used in larger amounts/longer than intended	11.0 (0.4)	18.2 (0.8)	10.4 (0.6)	93.0 (2.6)	15.0 (0.5)
4. Persistent desire for use	8.0 (0.8)	15.2 (0.7)	7.8 (0.4)	83.2 (7.5)	12.0 (0.5)
5. Great deal of time spent using, obtaining or recovering from use	1.5 (0.2)	3.2 (0.3)	0.4 (0.1)	36.2 (3.2)	2.5 (0.2)
6. Other activities given up for use	0.4 (0.1)	1.5 (0.2)	0.1 (0.04)	16.2 (2.3)	1.1 (0.1)
7. Continued use despite problems	2.8 (0.3)	5.0 (0.9)	1.4 (0.17)	48.8 (5.2)	4.0 (0.5)

The most commonly reported dependence symptoms among dependent drinkers were: using alcohol for longer or in larger amounts than intended; tolerance; and persistent desire for alcohol use (Table 14). Around half of dependent drinkers (49%) reported that they continued alcohol use despite having knowledge of alcohol-related problems, with just under half (43%) reporting withdrawal symptoms or using to avoid withdrawal symptoms. A relatively small proportion (16%) reported that other activities were given up for alcohol use.

3.4.2 STRUCTURE OF DSM-IV ALCOHOL DEPENDENCE

The structure of DSM-IV alcohol dependence was examined using Principal Components Analysis (PCA). This involves reducing the dependence criteria to a linear combination (a "component") that maximises the amount of variance of the criteria that is explained by the combination. The Principal Components Analysis of DSM-IV dependence symptoms among alcohol users revealed that one factor accounted for the majority of the variance, with no other factors having an eigenvalue of more than 1 (Table 15).

Table 15: PCA analysis of DSM-IV alcohol dependence (n = 7746)

	Factor loading
1. Tolerance	0.77
2. Withdrawal/use to avoid withdrawal	0.86
3. Used in larger amounts or for longer than intended	0.86
4. Persistent desire for use	0.83
5. Great deal of time spent using, obtaining or recovering from use	0.90
6. Other activities given up for use	0.92
7. Continued use despite knowledge of problems	0.86
Eigenvalue	**5.2**
% of total variance explained	**73.8**

This factor had an eigenvalue of 5.2 (out of a maximum possible value of 7) and accounted for around three quarters of the variance (74%). All dependence criteria loaded extremely highly on this factor: the highest loading was for the factor addressing time spent using, obtaining and recovering from alcohol (0.9), and the lowest for tolerance (0.77). These results suggest that all DSM-IV criteria could be grouped along this one dimension, which may be taken to be the "dependence syndrome".

The internal consistency of the DSM-IV dependence symptoms was high – the Alpha of the symptoms was 0.73. This was further indication that the symptoms formed a unidimensional scale (Streiner & Norman, 1995).

3.5 AGREEMENT BETWEEN ICD-10 AND DSM-IV DIAGNOSTIC SYSTEMS

3.5.1 DEPENDENCE

Results of the test of agreement between DSM-IV and ICD-10 dependence diagnoses revealed that there was a high level of agreement between the systems, with a Kappa of 0.80. Approximately 88% of persons meeting criteria for ICD-10 alcohol dependence also met criteria for DSM-IV alcohol dependence; while three quarters (74%) of those meting criteria for DSM-IV dependence also met criteria for ICD-10 dependence.

3.5.2 ABUSE/HARMFUL USE

The test of agreement between ICD-10 and DSM-IV diagnoses of abuse/harmful use revealed little agreement between the diagnostic systems for this diagnosis. The Kappa obtained was 0.07, which indicated that there was only slight agreement between the diagnostic systems. Only around 11% of persons meeting criteria for ICD-10 harmful alcohol use also met criteria for DSM-IV alcohol abuse; a further 11% of those meeting criteria for ICD-10 harmful use met criteria for DSM-IV dependence. An even smaller proportion (7%) of those who met criteria for DSM-IV alcohol abuse also met criteria for ICD-10 alcohol harmful use, while a small number (2.5%) of those meeting criteria for DSM-IV abuse met criteria for ICD-10 dependence.

4 DISCUSSION

4.1 PREVALENCE OF ALCOHOL USE, ABUSE AND DEPENDENCE

In the Australian adult population, around one in 25 persons (4.1%) met criteria for DSM-IV alcohol dependence within the past 12 months, with a further one in 50 (1.9%) meeting criteria for DSM-IV alcohol abuse. Clearly, alcohol use disorders affect a significant minority of Australian adults.

The rates of alcohol use disorders found in the Australian population are similar to those found in population studies carried out in other countries. The US National Comorbidity Survey (NCS), conducted in the early 1990s, found that around 2.5% of persons aged 15 to 54 years met criteria for DSM-III-R alcohol abuse and 4.4% for dependence within the past 12 months (Kessler et al., 1997). It is also similar to the estimates produced by the US Epidemiological Catchment Area study (ECA), which estimated that 6.8% of adults met criteria for DSM-III abuse and/or dependence within the past 12 months (Helzer et al., 1991); and to the prevalence estimate of 4.4% DSM-IV alcohol dependence from the US National Longitudinal Alcohol Epidemiological Survey (Grant, 1997).

However, the estimates of DSM-IV alcohol dependence obtained in the present study are slightly higher than those obtained using DSM-III-R criteria in a population study conducted in Canada. The Ontario Mental Health Survey, conducted with a representative sample of adults aged 15 to 64 years in Ontario, estimated that 1.5% of adults met criteria for DSM-III-R alcohol abuse within the past year, and 2.9% met criteria for dependence (Ross, 1995).

Among Australian adults, it was young males who were most likely to report problematic alcohol use. Three quarters of those who met criteria for DSM-IV alcohol abuse (76%) and dependence (72%) were male; a third were aged 18 to 24 years (37% for abuse, 30% dependence), with another quarter aged 25 to 34 years (27% abuse, 29% dependence). This is consistent with epidemiological research in other countries such as the US (Grant, 1997; Hall, 1996; Kandel et al., 1997).

Among alcohol users, it was those who had never been married, were divorced, separated or in a de facto relationship who were more likely to report more problematic alcohol use. Again, this is consistent with other research suggesting that marital status is a strong predictor of alcohol use, with married persons least likely to report problematic alcohol use (Grant, 1997; Power, Rodgers, & Hope, 1999).

Among those reporting alcohol use, it was those who were not in the labour force or who were unemployed who were more likely to also report *problematic* alcohol use, compared to employed persons (either on a part-time or full-time basis). This is consistent with previous epidemiological research in the US (Helzer et al., 1991).

Those who were more educated (completed secondary education or postsecondary education) were more likely to report any alcohol use within the past year, even after considering other demographics such as age and gender. Those who were more educated were also more likely to report more problematic alcohol use. However, this appeared to be due to the effects of other demographic variables – such as age and gender – since, when such variables were taken into account, educational

attainment no longer remained a predictor of problematic alcohol use among drinkers. Nevertheless, it must be remembered that half of persons meeting criteria for alcohol abuse (44%) or dependence (51%) have completed post-secondary qualifications. This is in contrast to US research that found that education is negatively related to involvement with alcohol use (Fillmore et al., 1998b) and use disorders (Helzer et al., 1991; Kandel et al., 1997), with less educated persons having an increased risk of developing alcohol abuse and dependence (Crum et al., 1992; Crum et al., 1993).

Males were more likely than females to report heavier drinking patterns (in terms of both quantity and frequency of alcohol use), consistent with other population-level research in Australia (Australian Institute of Health and Welfare, 1999). Dependent drinkers and those meeting criteria for alcohol abuse were also more likely to be drinking more heavily and frequently, as would be expected.

4.2 PATTERNS OF COMORBIDITY

Neuroticism was strongly related to the use and non-use of alcohol. Persons who reported drinking less than 12 standard drinks in the past year reported significantly higher levels of neuroticism than those who reported alcohol use without meeting criteria for a use disorder. Persons meeting criteria for alcohol dependence within the past year reported the highest levels of neuroticism. This pattern is consistent with other research (Ogden et al., 1989; Prescott et al., 1997; Rankin et al., 1982; Sieber & Angst, 1990).

There were two distinct patterns of comorbidity between alcohol use and other mental disorders. First, other substance use problems were more likely among persons who were alcohol users, and these problems were more likely in persons who abused alcohol or were alcohol dependent. Persons meeting criteria for DSM-IV alcohol dependence were the most likely of all to have a range of other substance use problems, including regular tobacco use (51%), DSM-IV cannabis use disorders (15%), and other drug use disorders (7.3%). Non-drinkers, in contrast, were less likely to be: regular tobacco users (15%); to have a cannabis use disorder (1%); and use other drug types. These findings are consistent with those of the ECA and NCS. The ECA found that those with alcohol abuse or dependence were significantly more likely to have used other drugs, and to have met criteria for another drug use disorder (Helzer et al., 1991). Similar results were also found in the NCS. Those meeting lifetime criteria for alcohol abuse or dependence were significantly more likely to also meet lifetime criteria for drug abuse or dependence (Kessler et al., 1997).

Second, other mental health problems did *not* follow a linear pattern: non-drinkers reported greater levels of psychopathology than unproblematic drinkers, while dependent drinkers reported the greatest levels of psychopathology. Non-drinkers were more likely than non-problematic drinkers to meet criteria for DSM-IV affective and anxiety disorders. They also reported higher levels of psychological distress and disability due to their mental health problems.

Multivariate analyses suggested that these higher rates of problems were in large part due to the fact that non-drinkers reported higher levels of trait neuroticism; i.e., they were more neurotic are more moody, irritable and anxious. When multivariate analyses were carried out, it was found that the difference between non-drinkers and unproblematic drinkers did not remain after controlling for neuroticism. The higher rates of problems reported by non-drinkers were largely explained by their higher neuroticism scores. This is suggestive of a difference between the two groups in personality

traits, which accounts for higher rates of mental health problems such as anxiety. However, it is possible that reports of stable traits (moodiness, anxiety, etc.) may be influenced by current mood states. Hence, controlling for reported neuroticism may have meant that a measure that was influenced by current mood state was also included in the analyses.

Persons meeting criteria for DSM-IV alcohol dependence were more likely than non-drinkers to meet criteria for DSM-IV anxiety and affective disorders, and reported significantly higher levels of psychological distress. These differences did not appear to be completely mediated by the effects of demographics, trait neuroticism, or other drug use. Persons who met criteria for alcohol abuse did not appear to differ from non-drinkers in their levels of psychological distress and mental disorders; after controlling for other variables, they were significantly *less* likely to report such problems.

Again, these patterns are consistent with US epidemiological data. The ECA found that persons with alcohol abuse or dependence were significantly more likely than those who did not to meet criteria for an affective and anxiety disorder (Helzer et al., 1991), findings which were replicated in the NCS (Kessler, 1995; Kessler et al., 1997). A population survey of British adults also found that those with higher levels of anxiety tended to have more problematic alcohol use (Farrell et al., 1998).

The finding that alcohol users reported lower levels of psychological distress and lower rates of affective and anxiety disorders is again consistent with previous research, in which it was found that moderate alcohol users reported lower levels of psychological distress than non-drinkers (Power et al., 1998). Interestingly, this relationship appeared to be due to higher levels of neuroticism among non-drinkers. Previous research suggests that when a particular type of substance use is prevalent in a population (as is alcohol), reporting *no use* can be an indicator of poor social adjustment and mental health (Shedler & Block, 1990). In particular, these researchers found that young persons reporting no cannabis use were more withdrawn, socially isolated and anxious than those reporting experimental cannabis use. The present finding may be interpreted in a similar manner – those who reported that they did not drink alcohol in the past year also reported that they were anxious, moody and irritable *as a personality trait.*

4.3 DSM-IV ALCOHOL DEPENDENCE SYNDROME

4.3.1 DEPENDENCE SYMPTOMS

The three alcohol dependence symptoms most commonly reported by Australian drinkers were using it in larger amounts or for longer than intended (15%), having a persistent desire for use (12%) and developing tolerance to alcohol's effects (10%). Male drinkers were more likely than female drinkers to report these dependence symptoms. Other dependence criteria were very rarely reported. All dependence criteria distinguished well between dependent and non-dependent drinkers. Few dependent drinkers reported giving up other activities for their alcohol use (16%), compared to almost all dependent drinkers reporting impaired control over their alcohol use (93%).

4.3.2 STRUCTURE OF DSM-IV DEPENDENCE

Principal Components Analysis (PCA) revealed that there was one factor that accounted for almost

three quarters (74%) of the variance in the dependence criteria. No other factors had an eigenvalue greater than 1. All dependence criteria loaded extremely highly on this factor. The internal consistency of the criteria (Alpha) was also very high. These results suggest that the structure of the alcohol dependence syndrome is even more unidimensional than it has been found in clinical or treatment samples, where around 50% of the variance in symptoms was accounted for by one factor (Allen et al., 1994; Caetano et al., 1999; Chick, 1980; Hall et al., 1993).

This suggests that in the Australian population, the alcohol dependence syndrome, as defined by DSM-IV criteria, is a unidimensional construct. There was no evidence to suggest that there were separate clusters of criteria; all appeared to be strongly related to one "dependence" factor. This is consistent with Edwards and Gross' notion of the alcohol dependence syndrome as a cluster of characteristic symptoms (Edwards & Gross, 1976). It suggests that the DSM-IV alcohol dependence criteria do assess behavioural symptoms that form a cluster. Future papers will explore this issue in further detail.

4.4 AGREEMENT BETWEEN ICD-10 AND DSM-IV DIAGNOSTIC SYSTEMS

Good agreement existed between the two diagnostic systems for diagnoses of alcohol dependence, with a high Kappa level and the majority of those classified as dependent by one diagnostic system also diagnosed as dependent by the other. This finding is consistent with other analyses of the agreement between DSM-IV and ICD-10 diagnostic systems among heavy drinkers in the US (Hasin et al., 1996a; Hasin et al., 1996b) and from a cross national study of persons from treatment and general community settings (Hasin et al., 1997). It suggests that the two systems are assessing a similar cluster of behaviours in their assessment of the dependence syndrome.

In sharp contrast to the agreement found for dependence, there was little agreement between ICD-10 and DSM-IV systems for diagnoses of harmful use/abuse, and around 1 in 10 persons meeting ICD-10 criteria for harmful alcohol use met DSM-IV criteria for dependence. Again, this is consistent with studies of treatment and community setting samples, which have found that there is little overlap between the systems in the persons diagnosed as having abuse/harmful use of alcohol (Hasin et al., 1997; Hasin et al., 1996a; Hasin et al., 1996b). This reflects the different approaches of the two classification systems to the definition of the harmful use/abuse diagnosis: ICD-10 emphasising negative health effects, and DSM-IV emphasising distress or impairment resulting from social, legal or work problems. The present findings showed that persons who were identified by each diagnostic system were largely separate; clearly, the distinction that the two diagnostic systems make for the abuse/harmful use diagnosis results in the identification of different groups of people.

4.5 TREATMENT IMPLICATIONS

A significant proportion of the Australian adult population met criteria for alcohol use disorders within the past year (4% dependence, 2% abuse). This does not imply that we should be more active in finding and encouraging persons with such disorders in the community to seek specialist treatment for alcohol dependence. There are a number of reasons why this may not be the most appropriate course of action.

First, a large number of persons who have alcohol use disorders are likely to remit from their

disorders without receiving professional help (Cunningham, Lin, Ross, & Walsh, 2000; Teesson & Hall, 2000). It would not be an efficient use of scarce specialist treatment resources to target the large number of persons who may have time-limited and minimally disabling disorders. Second, many persons with mild alcohol use disorders are not interested in receiving treatment (Grant, 1997). Finally, to try to identify and treat all alcohol use disorders in the community may also medicalise drinking behaviour that may be more appropriately changed through other means.

4.5.1 Public Health Alcohol Policies

A major development in the conceptualisation of alcohol use disorders and alcohol related health problems has been the development of a public health perspective on alcohol use (Teesson & Hall, 2000). This removes the focus from being exclusively upon the "alcoholic" by taking into account the characteristics of the physical and social environment that encourage hazardous drinking. This includes the advertising and promotion of alcohol, and the ready availability of alcohol at low prices (Edwards et al., 1994; Walsh & Hingson, 1987).

Reducing the alcohol consumption of the population can reduce the prevalence of alcohol-related problems in the community. This can be achieved by: laws and regulations reducing the availability of alcohol; measures which increase the price of alcohol to reduce consumption; and controls on the promotion of alcohol (Edwards et al., 1994; Walsh & Hingson, 1987). Unfortunately, such policies tend to be politically unpopular (Flaherty, Homel, & Hall, 1991).

4.5.2 Public Education about Alcohol

As a result, other approaches have been used, the most prominent of which has been public education of drinkers about the risks of alcohol use. In Australia, guidelines about the maximum number of standard drinks that can be legally consumed before driving, in combination with random breath testing, has reduced overall road fatalities and the proportion of fatalities in which the driver had a blood alcohol level above the prescribed level (Homel, 1989). These campaigns enjoy widespread public support and have probably also reduced alcohol consumption by providing an excuse for drinkers to moderate their consumption (Homel, 1989).

The Australian National Health and Medical Research Council (1992) has issued guidelines for "safe" levels of alcohol use, typically in the form of the number of standard drinks that can be consumed per day and per week with minimum risk to health. These guidelines have rarely been accompanied by an education campaign to explain their rationale or to tell the public about how to measure standard drinks. More recently, public understanding of "safe" levels of consumption has been complicated by widely publicised evidence that moderate alcohol consumption is of benefit to cardiovascular health (Chyou et al., 1997; Thun et al., 1997). The primary goal of these safe drinking limits has most often been to reduce the health complications of heavy drinking, such as, liver cirrhosis. More attention needs to be paid to explaining the risks of developing alcohol dependence from heavy drinking, binge drinking, and drinking to relieve withdrawal symptoms and hangovers.

4.5.3 Screening and Brief Intervention for Hazardous Drinkers

Persons who present for medical treatment can be screened for hazardous alcohol use and alcohol-

related problems. Those who are identified as drinking at hazardous levels can be advised to reduce or stop consumption and given simple steps to achieve these goals (Heather & Tebbutt, 1989).

Research has found that alcohol consumption and alcohol-related problems are reduced by such screening and brief advice in general practice and hospital settings (e.g. (Chick, Lloyd, & Crombie, 1985; Wallace, Cutler, & Haines, 1988)). Considerable evidence suggests that there is at most a small difference in outcome between brief interventions and inpatient treatment (Finney, Hahn, & Moos, 1996; Heather & Tebbutt, 1989; Mattick & Jarvis, 1993; Proudfoot & Teesson, 2000). This suggests that residential or inpatient treatment is not routinely required for all persons with alcohol use disorders.

There is also a good economic argument for brief intervention - it usually involves around 1 to 3 hours of screening and brief advice, costing a small fraction of intensive inpatient treatment for alcohol dependence. Given that conventional (inpatient) alcohol treatment results in economic benefits (Holder & Blose, 1986; Holder & Schachman, 1987; Walsh et al., 1991), a less intensive intervention would be even more economical. Such an intervention would also be available for a larger number of persons.

4.5.4 The Role of Specialist Addiction Treatment

Specialist treatment of alcohol use disorders will always be needed for those persons who do not respond to brief interventions. Controlled evaluations of inpatient treatment have demonstrated that about a third of such patients remain abstinent over a year, a third show substantial reductions in their drinking, while the drinking of the remaining third is largely unchanged (Heather & Tebbutt, 1989; Walsh et al., 1991). Such treatment also has a net economic benefit (Holder & Blose, 1986; Holder & Schachman, 1987; Walsh et al., 1991).

The suggestion has been made that those who are most likely to benefit from inpatient treatment are those with the most severe disorders. This "matching hypothesis" implies that patients who are appropriately matched to treatment will do better than those who are not. This has been viewed as a key to improved effectiveness of treatment for alcohol use disorders. Project MATCH, a large, statistically powerful treatment trial, was designed to test the matching hypothesis (Project Match Research Group, 1997). Contrary to expectation, the study failed to find evidence of robust matching effects. Aside from psychiatric severity, where small interaction effects were found, the effectiveness of treatment did not vary strongly with patient characteristics (Project Match Research Group, 1997).

The role of inpatient hospitalisation for severely affected alcoholics remains controversial (Moos, King, & Patterson, 1996). Respite care with charitable and voluntary agencies, and welfare services are important for the indigent and homeless. Whether we should continue to provide residential treatment programs based upon the traditional 12-step approach in hospitals is more contentious. The evidence for effectiveness is lacking but a case has been made on humanitarian grounds for some such provision (Mattick & Jarvis, 1993). Enrolment in Alcoholics Anonymous groups is an important and inexpensive resource for individuals wishing to avoid relapse, and especially for the homeless and socially isolated whose drinking has cost them their family and friends (Mattick & Jarvis, 1993).

4.5.5 ALCOHOL DETOXIFICATION

Detoxification is an important public health response to alcohol-related problems. It benefits the health of the drinker and the community by postponing the emergency presentation of more severe health problems, and it provides an opportunity for intervention and referral to other treatment services. It can often be accomplished under supervision in the home (Stockwell et al., 1991), although some severely dependent people and homeless alcohol dependent persons require inpatient treatment (Hall & Zador, 1997).

4.5.6 DEALING WITH COMORBID MENTAL DISORDERS

Alcohol use disorders complicated by other mental disorders have been recognised as having a poorer prognosis and being more difficult to treat than those without comorbid disorders (Drake, Bartels, Teague, Noordsby, & Clark, 1993; McLelland, Luborsky, Woody, O'Brien, & Druley, 1983). Comorbid disorders are more likely to be chronic and disabling, and result in greater service utilisation (Kessler, 1995). They therefore cause considerable misery and suffering among those afflicted by them, and considerable social costs in terms of marital breakdown, social isolation, poor educational attainment, unemployment and chronic financial difficulties (Kessler, 1995). Community surveys also indicate that cases with comorbid disorders are over-represented in clinical populations (Galbaud Du Fort, Newman, & Bland, 1993; Kessler, 1995).

We accordingly need to improve our treatment of persons with comorbid mental and substance use disorders. Specialist mental health services need to better recognise and treat comorbid substance use disorders among their clients. This is especially the case with anxiety and affective disorders, since substantial minorities of persons with these disorders who seek treatment in mental health services will have alcohol and other drug use disorders (Hall & Farrell, 1997). Specialist drug and alcohol services also need to better recognise the disorders that are most amenable to treatment, namely, the anxiety and affective disorders. Brief, valid and reliable screening tests exist which can detect anxiety and depressive disorders among alcohol and drug dependent persons, yet they are rarely used (Mattick, Oliphant, Bell, & Hall, 1996).

4.6 CONCLUSIONS

The present study has revealed that alcohol use disorders are among the most prevalent disorders in the Australian population, and are most common among young males. Very few persons with these disorders seek or receive treatment. This does not necessarily indicate that these disorders are grossly under-treated since many of the disorders identified in population surveys will remit without professional help. Public education about the risks of alcohol use may be the best way of preventing and ameliorating the public health impact of the prevalent, milder forms of alcohol disorders. Good advice on self-help strategies for quitting or cutting down may obviate the need for professional assistance in those coming to attention in primary health care. For those cases whose problems resist self-help, existing treatment systems need to provide more effective forms of treatment, more efficiently. Better triage would ensure a more rational use of scarce treatment resources. Further research is needed to further examine the issues raised in rhe present report, and to develop effective treatment approaches to address problematic alcohol use in the community.

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APPENDIX A

The covariates were coded as follows:

- Gender was coded 0 for females, and 1 for males.
- Age was coded: 18-24 years, 25-34 years, 35-44 years, 45-54 years, and 55 years and over.
- Education was coded: less than secondary schooling completed, secondary schooling completed, and post-secondary schooling completed.
- Marital status was coded: currently married, de facto, separated, divorced, widowed, or never married.
- Unemployment status was coded: employed full time, employed part-time, unemployed, not in the labour force.
- Score on the Neuroticism (N) scale of Eysenck's Personality Questionnaire (EPQ).
- Regular (daily) tobacco use was coded 0 for no, 1 for yes.
- Cannabis use more than 5 times in the past 12 months was coded 0 for no, 1 for yes.
- Other drug use (sedatives, stimulants or opiates) more than 5 times in the past 12 months was coded 0 for no, 1 for yes.

APPENDIX B

Results of multivariate logistic regression comparing non-drinkers with drinkers

	Coefficient	SE	Z	p	OR	95%CI
Male[1]	0.87	0.054	16.25	<.001	2.39	2.15, 2.65
Aged 25-34[2]	-0.22	0.098	-2.21	<.05	0.81	0.66, 0.98
Aged 35-44[2]	-0.30	0.096	-3.06	<.001	0.74	0.61, 0.90
Aged 45-54[2]	-0.37	0.100	-3.74	<.001	0.69	0.57, 0.84
Aged 55+[2]	-0.36	0.100	-3.62	<.001	0.70	0.57, 0.85
Completed secondary education[3]	0.16	0.071	2.30	<.05	1.18	1.02, 1.35
Completed post-secondary education[3]	0.35	0.052	6.80	<.001	1.42	1.29, 1.58
De facto[4]	0.36	0.115	3.12	<.001	1.43	1.14, 1.79
Widowed[4]	-0.57	0.084	-6.70	<.001	0.57	0.48, 0.67
Employed part-time[5]	-0.22	0.070	-3.11	<.005	0.80	0.70, 0.92
Unemployed[5]	-0.61	0.118	-5.18	<.001	0.54	0.43, 0.68
Not in the labour force[5]	-0.87	0.065	-13.52	<.001	0.42	0.37, 0.47

Result of multivariate ordinal logistic regression comparing different levels of drinking (non-disordered, abuse, and dependent)

	Coefficient	SE	Z	p	OR	95%CI
Male[1]	1.06	0.098	10.78	<.001	4.76	2.36, 3.49
Aged 45-54[2]	-0.49	0.14	-3.55	<.001	0.61	0.47, 0.80
Aged 55+[2]	-1.33	0.18	-7.42	<.001	0.26	0.19, 0.38
Never married[3]	1.09	0.11	9.82	<.001	2.97	2.39, 3.69
Divorced[3]	0.93	0.17	5.65	<.001	2.54	1.84, 3.51
Separated[3]	0.83	0.19	4.28	<.001	2.30	1.57, 3.38
Defacto[3]	1.02	0.16	6.43	<.001	2.76	2.03, 3.77
Unemployed[4]	0.67	0.16	4.22	<.001	1.95	1.43, 2.66
Not in the labour force[4]	0.32	0.12	2.54	<.02	1.28	1.07, 1.75
EPQ score	0.242	0.02	16.21	<.001	1.27	1.24, 1.31

Results of multivariate logistic regressions examining the association between substance use and alcohol involvement

	Coefficient	SE	Z	p
Regular tobacco use				
Alcohol use	0.53	0.06	8.47	<.001
Alcohol abuse	1.10	0.17	6.55	<.001
Alcohol dependence	1.13	0.12	9.31	<.001
Cannabis use				
Alcohol use	0.93	0.15	6.10	<.001
Alcohol abuse	1.50	0.24	6.23	<.001
Alcohol dependence	1.68	0.19	8.81	<.001
Cannabis use disorder				
Alcohol use	0.19	0.24	0.79	ns
Alcohol abuse	0.68	0.36	1.91	ns
Alcohol dependence	1.21	0.27	4.49	<.001
Other drug use				
Alcohol use	0.23	0.15	1.61	Ns
Alcohol abuse	0.93	0.30	3.09	<.005
Alcohol dependence	1.11	0.20	5.50	<.001
Other drug use disorder				
Alcohol use	-0.35	0.29	-1.22	Ns
Alcohol abuse	0.05	0.58	0.09	Ns
Alcohol dependence	0.92	0.33	2.78	<.005

Results of multivariate logistic regressions examining association between alcohol involvement and mental health problems

	Coefficient	SE	Z	p
DSM-IV affective disorder				
Alcohol use	-0.04	0.10	-0.39	ns
Alcohol abuse	-0.49	0.33	-1.50	ns
Alcohol dependence	0.67	0.16	4.16	<.001
DSM-IV anxiety disorder				
Alcohol use	-0.02	0.11	-0.19	ns
Alcohol abuse	-0.76	0.38	-1.963	<.05
Alcohol dependence	0.58	0.18	3.28	<.001
Psychosis case +				
Alcohol use	0.17	0.25	0.67	ns
Alcohol abuse	0.32	0.57	0.57	ns
Alcohol dependence	0.51	0.34	1.51	ns
GHQ case +				
Alcohol use	-0.09	0.08	-1.26	ns
Alcohol abuse	-0.64	0.27	-2.40	<.05
Alcohol dependence	0.04	0.14	0.29	ns