The relationship between tobacco use, substance-use disorders and mental health: results from the National Survey of Mental Health and Well-being

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Aims: **To examine comorbidity between tobacco use, substance-use disorders and mental health problems among Australian adults aged 18 years and over.** *Method*: **Data from the 1997 Australian National Survey of Mental Health and Well-being were analyzed. This survey was a stratified, multistage probability sample of 10,641 adults, representative of the Australian population. Univariate associations between tobacco use, substance use and mental health were examined, and then multivariate analyses were conducted to control for demographic characteristics, neuroticism, and other drug use.** *Measurements*: **Tobacco use status was defined as: never smoker, former smoker and current smoker. DSM-IV diagnoses of substance use, anxiety, and affective disorders were derived using the Composite International Diagnostic Interview (CIDI). Other measures included a screener for psychosis and measures of psychological distress and disability.** *Findings*: **Current tobacco use was strongly associated with abuse/dependence upon alcohol, cannabis, and other substances, and with higher rates of anxiety and affective disorders. Current smokers were more likely to screen positively for psychosis and reported greater psychological distress and disability than non-smokers and never smokers. These higher rates of other problems were not explained by differences in demographic characteristics, neuroticism scores, or by other drug use. Former smokers did not have higher rates of affective or anxiety disorders; however, they had higher rates of alcohol-use disorders, and of cannabis-use disorders after adjusting for covariates.** *Conclusions*: **Current tobacco use is associated with a range of other substance-use and mental health problems. These are likely to reduce the success of attempts to quit smoking. The presence of these other problems needs to be considered when considering smoking-cessation treatment, and further research may provide information on more effective treatment strategies for persons with co-existing substance-use and mental health problems.**

Introduction

After alcohol and caffeine, tobacco is one of the most widely used psychoactive substances in the general population (Anthony, Warner, & Kessler, 1994; Australian Institute of Health and Welfare, 1999; Farrell *et al.*, 1998; Warner, Kessler, Hughes, Anthony, & Nelson, 1995). In the most recently conducted Australian National Drug Strategy Household Survey (1998), one in four persons aged 14 years and over (26%) reported use of tobacco within the past year, with two-thirds (65%) reporting lifetime use (Australian Institute of Health and Welfare, 1999).

Studies in clinical populations have revealed high rates of tobacco use among persons with depression (Hughes, Hatsukami, Mitchell, & Dahlgren, 1986), anxiety disorders (Hughes *et al.*, 1986; Pohl, Yeragani, Balon, Lycaki, & McBride, 1992), and psychotic illnesses such as schizophrenia (Glass, 1990; Goff, Henderson, & Amico, 1992; Hughes *et al.*, 1986; Masterson & O'Shea, 1984; O'Farrell, Connors, & Upper, 1983). In clinical settings, tobacco use is also strongly associated

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with other substance use (Hays, Farabee, & Miller, 1998). It is more common among patients using greater amounts of alcohol and other drugs (Henningfield, Clayton, & Pollin, 1990), and among those with more problematic use of alcohol and other drugs (DiFranza & Guerrera, 1990; Hays *et al.*, 1998; Henningfield *et al.*, 1990). Research has also found that alcohol-dependent inpatients had more severe levels of nicotine dependence than controls (Marks, Hill, Pomerleau, Mudd, & Blow, 1997).

However, data on comorbidity patterns among persons coming to the attention of treatment services is prone to a number of biases (Berkson, 1946; Caron & Rutter, 1991; Galbaud Du Fort, Newman, & Bland, 1993). Epidemiological research has been conducted in the US on smoking among adults in the community (Anda, Williamson, Escobedo, Mast, Giovino, & Remington, 1990; Breslau, Kilbey, & Andreski, 1991; Kandel, Davies, Karus, & Yamaguchi, 1986), and longitudinal studies have examined tobacco use, depression, and anxiety among young adults in the US (Breslau *et al.*, 1991; Breslau, Kilbey, & Andreski, 1994) and Australia (Patton, Carlin, Coffey, Wolfe, Hibbert, & Bowes, 1998). These studies have found that depression and anxiety are more common among US adult smokers, and that young adult smokers are more likely to have symptoms of anxiety and depression. A US study of young adults also found that nicotine dependence strongly predicted dependence upon alcohol, cannabis, and other drugs (Breslau *et al.*, 1991).

The finding that tobacco use is associated with other mental health problems in population samples holds important public health implications. First, it suggests that smokers with mental health problems might have greater difficulty quitting use; for example, persons with depression are less likely to give up smoking (Anda *et al.*, 1990). Second, higher rates of smoking among persons with mental health problems means that this group faces greater risks of developing the physical health problems associated with tobacco use (US Surgeon General, 1982). Third, it suggests that smokers with mental health problems might require more intensive interventions to aid their quit attempts and to ensure that their mental health problems are not exacerbated by cessation (Borrelli *et al.*, 1998; Covey, 1999).

Although there is evidence from US epidemiological studies that tobacco use and mental health problems are associated, there has not been a comprehensive examination of this issue among Australian adults. A recent Australian paper has examined the prevalence of anxiety, affective and substance-use disorders by smoking status, age and gender using data from the recently conducted National Survey of Mental Health and Well-being (NSMHWB; Jorm, 1999). It found that current smoking was strongly related to mental disorders, but that the relationship was much more marked among younger smokers.

The current paper explores these relationships in more detail. It examines: (1) the characteristics of Australian adults who have never smoked tobacco, those who formerly did so and those who currently smoke tobacco; (2) the relationships between tobacco use, other drug use problems, and a range of indicators of mental health and wellbeing; and (3) the extent to which any observed associations between tobacco use and mental health are explained by demographic characteristics, neuroticism, or the use of other drug types.

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%.

All persons were asked whether they currently used tobacco. Respondents were assessed for alcohol-use disorders if they had consumed at least 12 standard drinks (each 10 g alcohol) in the last 12 months, and had consumed at least three drinks on one occasion. Respondents who reported using cannabis, stimulants, sedatives, or opiates more than five times in the past 12 months were assessed for a use disorder.

Respondents were asked about symptoms of a range of DSM-IV mental disorders in the last 12 months. The past year was chosen to minimize uncertainty about the recall of symptoms over longer periods. Mental disorders were assessed by a modified version of the Composite International Diagnostic Interview (CIDI; World Health Organization, 1997). It yielded diagnoses of the following disorders:

1. Substance-use disorders: alcohol abuse and dependence, as well as abuse and dependence on four drug classes: opiates, cannabis, stimulants, and sedatives;
2. Affective disorders: major depressive disorder, dysthymia, bipolar I disorder, bipolar II disorder;
3. Anxiety disorders: panic disorder, agoraphobia, social phobia, generalized anxiety disorder, obsessive–compulsive disorder, and post-traumatic stress disorder.

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, Robins, Cottler, Sartorius, Burke, & Regier, 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). Adequate agreement (overall Kappa=0.55) has been found between the Present State Examination (PSE) and CIDI interviews (Farmer, Katz, McGuffin, & Bebbington, 1987), while good agreement has been found between clinician and CIDI assessments (Kappa=0.77) (Janca *et al.*, 1992). The validity of the CIDI has been supported by broad agreement between the findings of the ECA and the NCS (Bland *et al.*, 1988; Robins & Regier, 1991).

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 (unpublished analyses; details can be obtained from the authors of this paper).

Several other measures of psychological wellbeing were included. First, Kessler's Psychological Distress scale, which assesses symptoms of nervousness, restlessness and depressed affect (Kessler, 1996). Second, the General Health Questionnaire (GHQ), which was designed as a screening instrument to detect non-psychotic psychiatric 'cases' in general health care settings (Goldberg & Williams, 1988). Both the categorical (screening positive as a likely case) and continuous methods of scoring the GHQ were used. Third, 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. Finally, the mental component summary of the Short Form 12 (SF-12) was included to assess role limitations due to emotional and mental health problems (Ware, Kosinski, & Keller, 1996).

Data analysis

Persons were categorized as current tobacco smokers, former smokers, or never smokers. All analyses were carried out using two dummy coded variables for tobacco use, to compare the 'never smoker' group as the reference category with 'former smokers' and 'current smokers'. Current smokers were not divided into 'daily' and 'non-daily' because the 'non-daily' category did not sufficiently distinguish between persons who smoked very rarely and those who smoked much more frequently. Separate analyses (not reported here) comparing rates of affective or anxiety disorders among non-daily/daily smokers indicated that there were no significant differences between them.

All prevalence estimates were weighted to conform to independent population estimates by State, part of State, age, and sex, while 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). Univariate associations between covariates and tobacco use were tested using Pearson's χ^2. Odds ratios (OR) and 95% confidence intervals (95%CI) for univariate associations were estimated using unweighted data; for all odds ratios and regression coefficients, the 'never smoker' group is used as the reference.

Multivariate analysis. Multivariate analysis was conducted in two steps. First, a range of covariates was included with the tobacco-use variables in predicting the mental-health/drug-use outcomes. These covariates were: gender; age (18–24 years vs. 25–34 years and so on until 75+ years); education (less than secondary completed vs. secondary completed, post-secondary completed); marital status (married/*de facto* vs. never married, widowed, separated/divorced); employment status (employed/not in the labor force vs. unemployed); other drug use (alcohol-use disorder; cannabis use in the past 12 months, and sedative/stimulant/opiate use in the past 12 months); score on the Neuroticism scale of the Eysenck Personality Questionnaire (EPQ); and the variable that weighted estimates to conform to independent population estimates by State, part of State, age, and sex.

Second, a limited number of interaction terms were included in the model. Interaction terms were only entered if the main effect of the tobacco use contrast was significant (e.g., if the 'current tobacco use' group had significantly higher odds of affective disorders compared to 'never smokers' after covariates were included in step one). Interactions between tobacco use, age and gender were included, as previous analysis of the NSMHWB data revealed that patterns of association between tobacco use and mental disorders varied according to these factors (Jorm, 1999). Given the large number of covariates included in the model, further interactions were not explored. Non-significant interaction terms were removed using a backwards-elimination method. Because of the large number of interaction terms (12 age × tobacco-use interaction, and two gender × tobacco-use interactions), the test of significance was set at $p<0.01$ to reduce the likelihood of Type I errors. Unless discussed in the results, no interaction effects remained significant in the models.

For continuous outcome variables (e.g., the GHQ), multivariate linear regressions were carried out. For dichotomous outcome variables (e.g., DSM-IV disorders), multivariate logistic regressions were carried out. Analyses were carried out using STATA Version 5.0 (STATA Corporation, 1997).

Results

One in four persons (25%) reported that they were current tobacco users, and 27% reported that they had smoked at some time. Table 1 shows demographic characteristics by smoking status. Higher proportions of males than females reported currently (27% vs. 23%) or formerly (32% vs.

Table 1. Demographic characteristics of Australian adults according to tobacco use status

	Never smoker % (SE) (*n* = 4976)	Former smoker % (SE) (*n* = 2898)	Current smoker % (SE) (*n* = 2767)
Prevalence	48.2 (0.5)	26.9 (0.4)	24.9 (0.6)
Female	55.1 (0.8)	21.8 (0.6)	23.0 (0.6)
Male	41.0 (0.9)	32.1 (0.7)	26.9 (0.9)
Age group			
18–24	55.5 (3.2)	10.4 (1.5)	34.1 (2.7)
25–34	49.7 (2.2)	17.7 (1.0)	32.7 (1.7)
35–44	44.6 (0.9)	27.4 (0.9)	28.0 (1.0)
45–54	44.9 (2.0)	32.8 (2.4)	22.3 (1.1)
55–64	46.7 (1.6)	36.7 (1.4)	16.7 (1.4)
65–74	45.6 (1.3)	40.7 (1.4)	13.7 (1.3)
75+	55.0 (4.4)	37.1 (4.4)	8.0 (1.2)
Education			
Less than secondary	42.1 (1.2)	28.3 (0.9)	29.6 (1.1)
Secondary only	53.0 (1.3)	21.8 (1.0)	25.3 (1.3)
Post-secondary	50.6 (1.3)	27.6 (0.6)	21.7 (1.0)
Marital status			
Never married	54.5 (1.9)	21.1 (1.2)	33.3 (1.7)
Married/*de facto*	47.0 (0.8)	31.5 (0.7)	21.6 (0.7)
Separated/divorced	33.8 (1.9)	28.6 (2.5)	37.6 (2.2)
Widowed	58.8 (2.4)	27.0 (1.6)	14.2 (2.4)
Unemployed	33.6 (4.2)	18.8 (1.8)	47.6 (3.7)
Employed/not in labor force	48.8 (0.6)	27.3 (0.4)	24.0 (0.6)
Mean EPQ score	2.4 (0.03)	2.6 (0.05)	3.1 (0.05)
Sedative, stimulant, or opiate use			
No	48.7 (0.5)	27.0 (0.5)	24.3 (0.6)
Yes	33.4 (4.0)	24.3 (2.9)	42.3 (2.9)

EPQ, Eysenck Personality Questionnaire.

22%) smoking (χ^2_{2df}=232.03, p<0.001). Current tobacco use was more common among younger persons (34% of those aged 18–24 years vs. 8% of those aged 75 years and over), while older persons were most likely to have given up smoking (37% vs. 10% of those aged 18–24 years; χ^2_{12df}=615.38, p<0.001).

Current smoking was more common among those who had completed fewer years of education (χ^2_{4df}=67.90, p<0.001). Those who were unemployed were more likely to be current smokers than those who were employed or not in the labor force (48% vs. 24%), while the latter group were more likely to have given up smoking at some point (27% vs. 19%; χ^2_{2df}=131.59, p<0.001).

Current tobacco users had higher average neuroticism scores than never smokers (M=3.1 vs. 2.4 respectively; χ^2_{24df}=182.2, p<0.001). Finally, those who had used other drugs (sedatives, stimulants or opiates) in the past 12 months were significantly more likely to be current smokers than those who had not used these drug types (42% vs. 24%; (χ^2_{2df}=68.47, p<0.001).

Substance-use disorders

Table 2 shows the weighted prevalence of substance use and mental disorders according to tobacco-use status, and the univariate odds ratios using never-smokers as the reference group. Current tobacco smokers were 5 times more likely than never smokers to meet criteria for an

alcohol-use disorder (13% vs. 3%, respectively; Table 2). They were also around 5.5 times more likely to meet criteria for a sedative, stimulant, or opiate-use disorder (2.4% vs. 0.4%). The association with cannabis use was even stronger, with current smokers around 9 times more likely than never smokers to meet criteria for a cannabis-use disorder (Table 2). Former smokers had significantly higher rates of alcohol-use disorders than never smokers (5% vs. 3%; OR 1.7, 95%CI 1.4, 2.2), but no other significant univariate differences existed between these two groups.

The strength of the association between tobacco use and all substance-use disorders was reduced after controlling for demographic variables, neuroticism, and other drug use (Table 3) but the relationships remained significant. Current tobacco users remained more likely to have a sedative, stimulant, or opiate-use disorder (OR 1.9), more likely to meet criteria for an alcohol-use disorder (OR 2.9), and more likely to meet criteria for a cannabis-use disorder (OR 5.0; Table 3). Former smokers remained significantly more likely to meet criteria for an alcohol-use disorder (OR 2.0; 95%CI 1.5, 2.6), and had similar odds of meeting criteria for a cannabis-use disorder as current smokers (OR 4.7, 95%CI 2.4, 9.1) after adjusting for the other factors examined here (Table 3).

Two significant interaction effects were found in these analyses. First, there was an interaction between current smoking and age, and alcohol-use disorders: current

Table 2. Weighted prevalence, univariate odds ratios (OR) and 95% confidence intervals (95%CI) of DSM-IV mental disorders and other mental health measures by tobacco use

	Prevalence (SE)	OR	95%CI
Alcohol use disorder			
Never smokers	3.1 (0.3)	1.00	
Former smokers	4.8 (0.9)	1.74	1.37, 2.21
Current smokers	13.1 (0.8)	5.00	4.09, 6.11
Cannabis use disorder			
Never smokers	0.8 (0.2)	1.00	
Former smokers	1.0 (0.3)	1.52	0.93, 2.49
Current smokers	6.4 (0.7)	9.10	6.27, 13.20
Drug use disorder			
Never smokers	0.4 (0.1)	1.00	
Former smokers	0.5 (0.2)	1.46	0.77, 2.80
Current smokers	2.4 (0.4)	5.47	3.29, 9.12
Anxiety disorder			
Never smokers	4.2 (0.3)	1.00	
Former smokers	4.9 (0.4)	1.13	0.92, 1.40
Current smokers	9.3 (0.8)	2.54	2.13, 3.03
Affective disorder			
Never smokers	5.1 (0.4)	1.00	
Former smokers	5.8 (0.5)	1.15	0.95, 1.39
Current smokers	10.9 (0.8)	2.32	1.97, 2.72
Psychosis screen +			
Never smokers	0.4 (0.1)	1.00	
Former smokers	0.7 (0.2)	1.51	0.84, 2.71
Current smokers	2.3 (0.4)	5.51	3.46, 8.76
GHQ case +			
Never smokers	12.2 (0.3)	1.00	
Former smokers	11.1 (0.4)	1.01	0.89, 1.17
Current smokers	15.3 (0.9)	1.49	1.30, 1.70

smokers aged 25–34 years were around half as likely to meet criteria for an alcohol-use disorder compared to never smokers aged 18–24 years (OR 0.57; 95%CI 0.39, 0.84). Second, there was an interaction between former smoking, sex, and cannabis-use disorders: males who were former smokers were significantly less likely than females who had never smoked to meet criteria for a cannabis-use disorder (OR 0.25; 95%CI 0.11, 0.56). The meaning and significance of these interactions is unclear.

Affective and anxiety disorders

Current smokers were more likely than never smokers to have met criteria for an affective disorder within the past year (11% vs. 5%; OR 2.3), and to have met criteria for an anxiety disorder (9% vs. 4%, OR 2.5; Table 2). This difference was reduced, but remained significant after adjusting for covariates; the odds of having an affective disorder were still 1.3 times higher and an anxiety disorder 1.5 times higher among current smokers (Table 3). There were no significant differences between those who had formerly and never smoked in the rates of affective and anxiety disorders (Tables 2 and 3).

Psychosis

Around 1 in 250 of those who had never smoked (0.4%) screened positively for psychosis, compared to 1 in 43

current smokers (2.3%; Table 2). Current smokers remained more likely to screen positively for psychosis than those who had never smoked after conducting multivariate analyses (95%CI 1.7, 3.8; Table 3). There were no differences between those who had formerly and never smoked in the likelihood of screening positively for psychosis.

Psychological distress and disability

Mean GHQ scores were significantly higher among current smokers than never smokers (Table 4). Around 15% of current smokers and 12% of never smokers met the cut-off point for a possible psychiatric 'case' on the GHQ, with current smokers 1.5 times more likely to screen positively than never smokers (Table 2). While this difference was no longer significant after controlling for covariates (Table 3), current smokers still had significantly higher mean GHQ scores than non-smokers (Table 5). No differences existed between former smokers and never smokers in either the rate of persons screening positively on the GHQ (Tables 2 and 3), or mean GHQ scores (Tables 4 and 5).

Similar patterns existed for other measures of psychological distress and disability (Tables 4 and 5). Current smokers reported significantly greater role limitations due to emotional problems, as assessed by the SF-12 (Table 4). This relationship was substantially reduced

Table 3. Adjusted odds ratios (OR) and 95% confidence intervals (95%CI) for DSM-IV mental disorders and other and mental health measures, by tobacco use

	OR	95%CI
Alcohol use disorder		
Never smokers	1.00	
Former smokers	1.92	1.48, 2.49
Current smokers	3.39	2.63, 4.39
Cannabis use disorder		
Never smokers	1.00	
Former smokers	4.65	2.37, 9.12
Current smokers	5.00	3.35, 7.45
Drug use disorder		
Never smokers	1.00	
Former smokers	1.28	0.66, 2.49
Current smokers	2.16	1.23, 3.78
Anxiety disorder		
Never smokers	1.00	
Former smokers	1.01	0.79, 1.28
Current smokers	1.50	1.21, 1.87
Affective disorder		
Never smokers	1.00	
Former smokers	1.06	0.86, 1.31
Current smokers	1.37	1.13, 1.67
Psychosis screen +		
Never smokers	1.00	
Former smokers	1.40	0.77, 2.55
Current smokers	2.83	1.72, 4.71
GHQ case +		
Never smokers	1.00	
Former smokers	0.93	0.80, 1.09
Current smokers	1.06	0.90, 1.23

after controlling for demographic characteristics and other drug use, but remained statistically significant (Table 5). In contrast, former smokers did not have significantly different scores on the SF-12, and after adjustment, they had significantly *higher* scores (indicating better functioning) than never smokers (Tables 4 and 5).

Scores on Kessler's psychological distress scale were significantly lower among current (M=44.6) and former (M=46.0) smokers than among never smokers (M=46.3; Table 4). Satisfaction with life as a whole (Delighted–Terrible scale) was also significantly lower among current smokers (M=3.0) and former smokers (M=2.8) than among never smokers (M=2.7, Table 4). The differences between current and never smokers remained after adjustment for covariates; the differences between former smokers and never smokers did not (Table 5).

Discussion

Among a representative sample of Australian adults, a number of demographic characteristics were related to tobacco use. Males were more likely to be current or former smokers, those aged 18–24 years were most likely to be current smokers, and older persons were more likely to have given up smoking. Less educated persons were more likely to be current smokers, while

more educated persons were more likely to have given up at some point in time. Smoking among unemployed persons was markedly higher, and those who were employed or not in the labor force were much more likely to have given up smoking. These patterns are consistent with those found in epidemiological research conducted in other countries (Kandel, Chen, Warner, Kessler, & Grant, 1997; Warner *et al.*, 1995; Whitlock, MacMahon, Vander Hoorn, Davis, Jackson, & Norton, 1997).

Scores on the Neuroticism scale of the EPQ were higher among current smokers, suggesting that tobacco smokers might have higher trait levels of emotional lability and negative affect. This finding lends support to other findings that neuroticism is a significant correlate of tobacco use (Breslau, Kilbey, & Andreski, 1993; Gilbert & Gilbert, 1995; Kendler, Neale, Sullivan, Corey, Gardner, & Prescott, 1999; Sieber & Angst, 1990). The stronger relationship between neuroticism and tobacco use in more recent times suggests that with the decline in overall population rates of tobacco use, more neurotic persons may be more likely to begin smoking, and/or less likely to quit smoking once they have started (Gilbert & Gilbert, 1995).

Tobacco use and other drug use

DSM-IV alcohol, cannabis, and other drug-use disorders were significantly more common among current smokers than among those who had never smoked, as has been found in previous clinical and community research (Breslau *et al.*, 1991; DiFranza & Guerrera, 1990; Hays *et al.*, 1998; Henningfield *et al.*, 1990; Madden *et al.*, 1997). For all drug-use disorders, the association with current smoking was not explained by the covariates examined here: demographic characteristics, neuroticism, or other drug use. Interestingly, former smokers had higher rates of alcohol-use disorders than never smokers, and after adjusting for other factors, they also had higher rates of cannabis-use disorders. It must be noted, however, that there are covariates that have not been included in the present analyses, including genetic factors, which may play a role in increasing the risk of both smoking and problematic drug use.

These results come as increasing attention is being given to smoking cessation treatment in persons with problematic substance use (McIlvain & Bobo, 1999). Fears that it may be unsafe to target smoking among persons in treatment for problematic substance use have proved unfounded, with a number of studies demonstrating the safety of such interventions (Bobo & McIlvain, 1998; Hurt *et al.*, 1994). Furthermore, there is increasing evidence that persons seeking treatment for substance use problems are also considering quitting smoking (McIlvain & Bobo, 1999; Sees & Clarke, 1993). Research has suggested that relapse to alcohol use is *less* likely among persons given a smoking cessation intervention, and that those who are abstinent from smoking are more likely to remain abstinent from alcohol (Bobo,

Table 4. Mean scores on measures of mental well-being by tobacco use, and significance of association

	Mean (SE)	Standardized beta coefficient[a]	Coefficient[a] (SE)	t (p value)
GHQ				
Never smokers	0.84 (0.03)			
Former smokers	0.85 (0.03)	0.00	0.01 (0.05)	ns
Current smokers	1.18 (0.04)	0.08	0.38 (0.05)	8.04 (<0.001)
Kessler's PD scale (M)				
Never smokers	46.31 (0.06)			
Former smokers	46.00 (0.09)	−0.03	−0.33 (0.12)	−2.69 (<0.01)
Current smokers	44.62 (0.12)	−0.16	−1.85 (0.12)	−15.09 (<0.001)
SF−12 mental				
Never smokers	52.47 (0.12)			
Former smokers	52.64 (0.16)	0.00	0.02 (0.22)	ns
Current smokers	50.32 (0.20)	−0.12	−2.61 (0.22)	−11.80 (<0.001)
Delighted–terrible scale				
Never smokers	2.66 (0.01)			
Former smokers	2.78 (0.02)	0.04	0.10 (0.03)	3.81 (<0.001)
Current smokers	2.99 (0.02)	0.14	0.36 (0.03)	13.80 (<0.001)

[a] Coefficients refer to change relative to the 'never smoker' group.

McIlvain, Lando, Walker, & Leed-Kelly, 1998; McIlvain & Bobo, 1999; Sobell & Sobell, 1996). Future research is needed to examine treatments for smoking cessation among persons in treatment for other types of drug dependence.

Tobacco use and depression

In Australia, current smokers were more likely than never smokers to have an affective disorder and this relationship remained when controlling for demographic variables, neuroticism, and other drug use. Measures of psychological distress that include symptoms of depression (Kessler's Psychological Distress Scale, the SF-12, and the GHQ) were also significantly related to smoking status, with current smokers reporting higher levels of distress. These findings are consistent with previous research in other populations showing an association between tobacco use and depression (Anda *et al.*, 1990; Glassman, Helzer, & Covey, 1990; Glassman *et al.*, 1988; Kandel & Davies, 1986; Kandel *et al.*, 1986; Kendler, Neale, MacLean, Heath, Eaves, & Kessler, 1993; Patton *et al.*, 1998; Pomerleau, 1997).

While the association between depression and current tobacco use in the Australian population is not due to the confounding variables considered here, other explanations of the association cannot be excluded. Nonetheless, the finding that tobacco use is associated with affective disorders and depressive symptoms has potentially important clinical and public health implications. Depression decreases the likelihood that attempts to quit smoking will be successful (Anda *et al.*, 1990), and depressed mood is a common symptom of nicotine withdrawal (Madden *et al.*, 1997). Antidepressants may therefore aid smoking cessation in persons who have symptoms of depression (Hughes, Stead, & Lancaster,

Table 5. Adjusted association between tobacco use and other measures of mental well-being

	Standardized beta coefficient[a]	Coefficient[a] (SE)	t (p value)
GHQ			
Former smokers	−0.01	−0.05 (0.04)	ns
Current smokers	0.02	0.09 (0.05)	2.01 (<0.05)
Kessler's PD scale (M)			
Former smokers	−0.00	−0.02 (0.09)	ns
Current smokers	−0.05	−0.61 (0.09)	−6.17 (<0.001)
SF−12 mental			
Former smokers	0.02	0.31 (0.19)	ns
Current smokers	−0.02	−0.61 (0.20)	−3.10 (<0.005)
Delighted–terrible scale			
Former smokers	0.01	0.02 (0.02)	ns
Current smokers	0.07	0.18 (0.02)	7.42 (<0.001)

[a] Coefficients refer to change relative to the 'never smoker' group.

1999; Hurt *et al.*, 1997; Jorenby *et al.*, 1999). The use of nicotine replacement therapies may also aid attempts to quit (Silagy, Mant, Fowler, & Lodge, 1994). The combination of nicotine replacement therapy and the antidepressant bupropion may be particularly useful among those at risk of depression (Jorenby *et al.*, 1999).

Former smokers did not have higher rates of depression or anxiety, and they did not have higher scores on measures of psychological distress, compared to those who had never smoked. This is consistent with the possibility that smokers without problems such as depression may find it easier to give up than those who *do* have such problems (Anda *et al.*, 1990). It may also be that former smokers were less heavy smokers and hence found it easier to give up than those still smoking. However, it is not possible to determine the nature of the association on the basis of these cross-sectional data.

Tobacco use and anxiety

Australian current smokers also had higher rates of anxiety disorders that persisted after controlling for demographics and other drug use, as is consistent with previous research (Breslau *et al.*, 1991; Hughes *et al.*, 1986; Patton *et al.*, 1998; Pohl *et al.*, 1992). Higher scores were also reported by current smokers on measures of psychological distress in which symptoms of anxiety were included (SF-12, GHQ, and Kessler's Psychological Distress Scale).

There has been considerably less research out on the nature of the relationship between smoking and anxiety. One possibility is that, as with depression, anxious persons may find it more difficult to give up smoking (Gilbert & Gilbert, 1995). Consistent with this, former smokers did not have higher rates of anxiety disorders or levels of psychological distress than those who had never smoked. Again, it may also have been due to former smokers' less heavy smoking habits. Evidence suggests that anxiolytics are *not* effective smoking cessation aids (Hughes *et al.*, 1999). Effective treatments for anxiety may be needed for smokers with anxiety problems.

Tobacco use and psychosis

Current smokers were significantly more likely to screen positively for psychosis. This finding is in accord with the high rates of tobacco smoking observed in clinical samples of persons with psychotic illnesses, particularly schizophrenia (Dalack, Healy, & Meador-Woodruff, 1998; Diwan, Castine, Pomerleau, Meador-Woodruff, & Dalack, 1998; Fowler, Carr, Carter, & Lewin, 1998; Glassman, 1993; Hughes *et al.*, 1986). High rates of tobacco smoking were also observed in an Australian study of persons with psychotic illnesses in the community who were in contact with health services (Jablensky *et al.*, 2000). It is also consistent with recent research showing that persons with psychotic illnesses in the UK

general population have an extremely high prevalence of tobacco use (Farrell *et al.*, 1998).

The association between tobacco use and psychotic symptoms remained significant after controlling for demographics, neuroticism, and other drug use. Other explanations cannot be examined here, but it has been suggested that nicotine may be used to self-medicate some psychotic symptoms (Gilbert & Gilbert, 1995; Griffith, O'Neil, Petty, Garver, Young, & Freedman, 1998; McEvoy & Brown, 1999), or that persons with psychosis may have reduced concern about the adverse health effects of smoking (Gilbert & Gilbert, 1995).

The significantly higher rate of smoking among persons with psychosis means they are at greater risk of tobacco-related diseases such as lung cancer (US Surgeon General, 1982). This risk may be particularly high since there is evidence to suggest that persons with psychosis smoke more heavily and use higher tar cigarettes (Masterson & O'Shea, 1984). Nicotine substitution for abstinence or possibly for maintenance purposes may reduce these harms. Unfortunately, there is very little research that has examined the adequacy of such treatments for this group. Future research could evaluate the feasibility of interventions aimed at assisting smokers with psychotic illnesses to reduce or stop their tobacco use.

Acknowledgments

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