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Frequent alcohol, nicotine or cannabis use is common in young persons presenting for mental health care: a cross-sectional study

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Abstract

Objectives: To determine the prevalence of recent alcohol, nicotine or cannabis use in young persons presenting for mental health care.

Design: A cross-sectional study of young people seeking mental health care completed self-report questionnaires regarding their use of alcohol, nicotine or cannabis.

Setting: Data were collected from two sites as part of the national *headspace* services program.

Participants: 2,122 young people age 12 to 30 years provided information as part of a patient register; a subset of N=522 participants also provided more detailed information about their patterns of alcohol use.

Outcome measures: Prevalence of levels of recent alcohol, nicotine or cannabis use within relevant age bands (12-17, 18-19 and 20-30) or primary diagnostic categories.

Results: The rates for use *at least weekly* of alcohol for the three age bands were 12%, 39% and 45%, and for cannabis 7%, 14% and 18%, respectively. The rates of *daily* nicotine use for the three age bands were 23%, 36% and 41%. The pattern of alcohol use was characterised by few abstainers as well as many risky drinkers. Age of onset across all three substances was approximately 15 years. Individuals who used any of the three substances more frequently were likely to be older, male or have psychotic or bipolar disorders.

Conclusions: Frequent use of alcohol, nicotine or cannabis use in young people seeking mental health care is common. Given restricted legal access, the patterns of use in those aged 12-17 years are particularly notable. Reductions in substance use needs to be prioritised within services for at-risk young people.

Article summary

Article focus:

- Previous studies indicate that early substance misuse increases the risk of developing a mental illness;
- Early onset mental disorders are associated with increased risk of alcohol or other substance misuse;
- In this study, we determined the rates of alcohol, nicotine or cannabis use in young persons (aged 12 to 30 years) entering mental health care.

Key messages:

- Alcohol, nicotine or cannabis uses in young people who present for mental health care are common and frequent;
- Given the comorbidity with significant mental health problems, these patterns of frequent substance use are likely to contribute to increased risk of poor physical and/or mental health outcomes;
- Reductions in use of these substances needs to be prioritised within services provided to these at-risk young people.

Strengths and limitations of this study:

- A cross-sectional study of a large number of young persons seeking mental health care;
- Findings in the 12 to 17 year old age group are particularly novel;
- Key substance use measures were self-report only and not confirmed by interview;
- Participants were not asked about the amount of nicotine and cannabis use.

Introduction

Health prevention priorities in Australia include cessation of nicotine or cannabis use and reduction in alcohol-related harm[1-3]. Among those with mental illness, reductions in substance use-related harm and improved cardiovascular health are key clinical objectives. Epidemiological and longitudinal studies indicate that early substance misuse increases the risk of developing a mental illness and, conversely, early onset mental disorders are associated with increased risk of alcohol or other substance misuse[4-6].

Neurobiological studies increasingly demonstrate the adverse effects of alcohol or cannabis on brain development in teenagers and young adults[7]. Young people with mental disorders are at increased risk of later cardiovascular disease[8]. One of the most significant modifiable risk factors in this population appears to be cigarette smoking.

Within the new primary-care based mental health initiative, *headspace*: the national youth mental health foundation, a strong policy emphasis is placed on active management of alcohol or other substance-misuse problems. While it is clear that these new centres have the capacity to engage young people, the extent to which concurrent alcohol, nicotine or other substance misuse is being actively managed is yet to be identified.

From a physical health perspective, there is an urgent need to establish an early intervention agenda for these individuals who are at high risk of premature death or physical health morbidity from a range of medical conditions. Of particular note are the high rates of premature death due to cardiovascular disease in persons with depression and the prevalence of metabolic syndrome in those receiving treatments for major mood disorders. Additionally, the high rate of nicotine and cannabis use in young people with major mental health disorders puts them at risk of other smoking-related conditions. In this study, we determined the rates of alcohol, nicotine or cannabis

use in young persons entering mental health care. Additionally, we sought to assess the patterns of comorbidity with specific mental disorders.

Methods

Participants aged 16 years or older provided their own written informed consent and parental/guardian consent was obtained for those under 16 years. The University of Sydney Human Research Ethics Committee approved the study.

Sample(s): Participants were recruited from two headspace[9] sites: (i) the Brain & Mind Research Institute, Camperdown; and (ii) Campbelltown (outer suburban, south-western Sydney). These services specialise in the assessment and early intervention of mental health problems in young people[10, 11].

This study utilised data obtained from 2,122 young people (12 to 30 years) who entered our patient register. A subset of 522 participants also took part in specialised neurobiological research related to clinical outcomes. Participants were excluded if they did not have sufficient English-language skills. Hereafter, the entire sample (N=2,112) is referred to as the 'Youth Mental Health' (YMH) cohort. Referring clinicians were asked to determine primary and secondary diagnoses based on DSM-IV criteria. For the purposes of this study, patients were then grouped into the relevant broad categories (primary diagnoses) of 'depression', 'bipolar', 'anxiety', 'psychosis', 'behavioural/developmental', 'other' (which included autistic spectrum, learning disorder, substance use disorders, and personality disorders), and 'unclear', as described in our previous study[11].

Assessment: Clinical information was obtained via: (i) brief self-report questionnaire; and (ii) clinical assessment (detailed methods have been described previously[10, 11]).

Self-report: The questionnaire comprised basic demographic data as well as standardised questionnaires to measure common symptoms, psychosocial functioning, disability and vocational status upon entry to the service (findings reported previously[10, 11]). Participants were asked about their lifetime and current substance use using the first two items of the World Health Organization's 'alcohol, smoking and substance involvement screening test' (WHO-ASSIST)[12]. In item 1, participants were asked whether they ever used: (a) tobacco (nicotine) products; (b) alcoholic beverages; or, (c) cannabis. Subsequently, item 2 asked whether their use of each substance in the *past 3 months* was: (a) 'never'; (b) 'once or twice'; (c) 'monthly'; (d) 'weekly'; (e) 'daily or almost daily'.

Data Reduction: As a means to compare recent alcohol, nicotine or cannabis use in the YMH cohort with that of the general population the WHO-ASSIST item 2 data were re-categorised to align with the age bands and use categories of the 2010 National Drug Strategy Household Survey (NDSHS)[13]. Thus, responses were re-categorised as: (i) 'daily or almost daily'; (ii) 'weekly'; (iii) 'less than weekly' or (iv) 'never'. That is, responses of 'once or twice' and 'monthly' were collapsed to form the 'less than weekly' category. Furthermore, the YMH cohort was stratified into three age groups: (i) 12 to 17 years; (ii) 18 to 19 years; and (iii) 20 to 30 years.

Clinical assessment: Undertaken by psychiatrists, psychologists, mental health nurses or general practitioners with training in mental health. The assessing clinician verified key aspects such as primary and secondary diagnoses/comorbidities, vocational status, medical comorbidity and general functioning via the social and occupational function assessment scale (SOFAS)[14].

Detailed assessment of alcohol use: For the sub-sample (N=522) only, the Alcohol Use Disorders Identification Test (AUDIT) was used to assess each participant's level of risky drinking in the past year, as well as their lifetime familiarity[15, 16]. Total scores range of from 0-40, with a higher score indicating more problematic drinking. A total score of 1 to 7 is indicative of low risk drinking;

total scores 8-15 indicate 'risky drinking' with a moderate risk of harm; 16-19 indicating a high-risk or 'harmful' level of alcohol consumption, and 20-40 indicates a 'high-risk' level.

Statistical Analyses: Statistics were performed using SPSS for Windows 20.0. Group differences in demographic and clinical variables were assessed via ANOVA or chi-square tests. To determine whether age was a contributing factor to observed differences in prevalence of recent substance use across diagnostic groups, logistic regressions were conducted with a dichotomous dependent variable of 'at least weekly' versus 'less than weekly' use.

Results

Lifetime use

Among males, three quarters (75.9%; 506/667) of respondents (12 to 30 yrs) reported a lifetime use of alcohol, 63.3% (401/633) a lifetime use of nicotine and more than half (57.9%; 390/673) a lifetime use of cannabis. Similarly, for females, the lifetime rates were 75.6% (573/758), 60.3% (290/440) and 51.3% (391/762), respectively.

Age of first use

For males, the self-reported 'age of first use' for each substance was as follows: (i) alcohol = 14.6 ± 2.4 yrs (N=456); (ii) nicotine = 14.0 ± 2.6 yrs (N=385); and (iii) cannabis = 14.8 ± 2.9 yrs (N=127). For females, the age of first use for each substance was: (i) alcohol = 14.6 ± 2.3 yrs (N=531); (ii) nicotine = 14.2 ± 2.4 yrs (N=414); and (iii) cannabis = 15.6 ± 3.0 yrs (N=126). The age of first use of cannabis was significantly earlier in males [$F(1, 252)=5.7$, $p<.05$].

Recent use

The prevalence of each category of alcohol use increased with age (see Table 1a). The prevalence of daily and weekly drinking in the youngest (12-17 yrs) group was notable (almost 13%). In terms of sex differences, the most substantial differences were the increased rates of daily alcohol use in males in the 18-19 yrs and 20-29 yrs age groups (9.3% vs. 3.6% and 15.4% vs. 8.4%, respectively).

Almost one quarter (23.1%) of the younger group (12-17 yrs) used nicotine daily (see Table 1b). For the older groups the rates were 36 and 41%, respectively. While there were no substantial differences between younger (12-17 yr old) females and males in recent nicotine use, in the older groups, the proportion of daily nicotine use was higher in males (40.9% vs. 32.0% for 18-19 yrs; 48.0% vs. 34.6% for 20-30 yrs).

Notably, for the two younger groups (12-17 yrs and 18-19 yrs), the prevalence of daily cannabis use (see Table 1c) was higher than that for daily alcohol use (3.6% vs. 1.5% and 8.8% vs. 6.0%). Almost 20% of the 12-17 yrs group used cannabis at least once in past 3 months compared to more than 30% of the two older groups (33.1% and 36.0%, respectively). As with alcohol and nicotine, the males in two the older age groups were more likely to report using cannabis daily.

The relationships between substance and primary diagnostic categories are shown in Tables 2a, 2b and 2c. There was a significant main effect of age for the 'at least weekly' alcohol drinkers in each diagnostic group [$F(6,570)=9.9$, $p<.001$]. Those with a primary diagnosis of a bipolar spectrum disorder were the most likely to report at least weekly use of alcohol (at 39.4%). Within the depression and psychosis groups, young males report frequent use of alcohol.

There was a significant main effect of age across the diagnostic groups for 'at least weekly' users of nicotine [$F(6,749)=18.2$, $p<.001$]. The rate of 'at least weekly' use of nicotine was above 40% for four of the seven diagnostic categories (see Table 2b), with psychosis having the highest rate at 48.7%. The greatest difference between the sexes in terms of rates of 'at least weekly' nicotine use was seen in the psychosis group (37.5% vs. 53.8%).

There was a significant main effect of age across the diagnostic groups for 'at least weekly' cannabis use [F(6,240)=6.4, p<.001]. Across all but one of the diagnostic groups males were more likely to be weekly cannabis users. The group with the highest prevalence of weekly cannabis use was males with 'other' diagnoses at 24.0%, but this was also notable in males with psychotic (17.5%) or bipolar (15.4%) disorders.

Logistic Regression Models

In females, for nicotine, the significant model [χ^2 (13)=45.2, p<.001] included only age as a predictor (p<.01). Similarly, for cannabis, the model [χ^2 (13)=33.2, p<.001] only included age (p<.01). For alcohol in females no model was acceptable. In males, for nicotine, the highly significant model [χ2 (13)=107.9, p<.001] included age (p<.001), diagnosis (p<.01) and age-by-diagnosis (p<.01) as predictors. Similarly, for cannabis the model [χ2 (13)=59.5, p<.001] only included age (p<.01). For alcohol in males there was no acceptable model.

Detailed alcohol use

Table 3 displays the demographics and social-occupational functioning of the subset (N=522) sample. As predicted, abstainers (N=159) were the youngest group; ANOVA comparing age across the five drinking categories was highly significant [F(4,521)=27.1, p<.001]. Scheffe's post-hoc tests confirmed that only the abstainers group significantly (p<.001) differed (in age) from any other group. After omitting the abstainers, there were no significant differences across the four drinking categories in terms of distribution of gender or age, however there was a difference in age of psychiatric onset [F(3,289)=3.2, p<.05].

Table 4 displays the proportions of individuals across the alcohol use categories by each primary diagnosis group. As observed in the larger sample, the diagnosis groups were found to differ in mean age [F(6,521)=18.4, p<.001]. In terms of 'risky' drinking (i.e. hazardous or harmful or high-

risk) the diagnostic groups differed with the bipolar groups having the largest proportion (46.7%) whereas the behavioural/developmental and 'unclear' groups had the lowest proportions of 'risky' drinkers (24.0% and 16.7%, respectively). A logistic regression with the dependent variable being 'no or low-risk' drinking (i.e. abstainers and low-risk) versus 'risky' (the remaining three categories) was found to show acceptable goodness-of-fit and a significant model [χ^2 (20)=6.3, p<.001] with only age as a predictor (p<.01).

Discussion

Despite adolescence being the peak period for the onset of both mental and substance misuse disorders, primary care based studies indicate these problems are not being effectively managed in young people. National community-based surveys have indicated the extent to which young people do not access care for either mental disorders or alcohol/substance misuse, and this lack of care is most evident for young men and for those with alcohol/substance misuse[17].

This study demonstrates that among young people who present for mental health care through the *headspace* network, alcohol, nicotine or cannabis uses are common. Given the comorbidity with significant mental health problems, these patterns of substance use are likely to contribute to increased risk of poor physical and/or mental health outcomes. The prevalence of any lifetime use of both nicotine and cannabis was higher in this YMH cohort compared to general population[13] rates observed in individuals aged 14 or higher (61.8% vs. 42.2%; and 47.8% vs. 35.4%, respectively).

The youngest patient group (12-17 yrs) was twice as likely to report weekly alcohol use compared to their general population peers (10.3% vs. 5.3%)[13]. Daily alcohol use in this YMH cohort was more than three times greater than that observed in the general population (across age groups)[13]. Similarly, daily nicotine use in the YMH cohort is twice as high as the general population

estimates[13]. These comparisons should be treated somewhat cautiously as the NDSHS[13] determined frequency use over the past 12 months whereas this study assessed the past 3 months.

The relationships between recent substance use and diagnosis were complex, and were mainly affected by both age and gender. The logistic regressions models for nicotine or cannabis use were acceptable and in three of these models, only age was a significant predictor of weekly use; the exception being nicotine use in males where age and diagnosis both contributed. The difference in the prevalences of weekly nicotine use among males with an anxiety disorder as compared to males with a psychotic disorder is notable. In general, weekly substance use appeared to be more likely if an individual was an older male and diagnosed with psychosis or bipolar disorder.

Information regarding the prevalence of frequent substance use among younger people seeking mental health care is limited. There is a general consensus that substance misuse in individuals with a mental disorder is common[6, 18, 19]; with evidence to suggest that 'problematic substance use is the most common comorbid condition among people with a major mental illness and is associated with poorer patient outcomes'[20]. In a large cross-sectional study of over 45,000 Australians attending primary care, 12% of respondents were identified as having any mental disorder with concurrent substance misuse[18].

Of considerable relevance to preventing later poor physical health, at least weekly nicotine use was highly prevalent in those with psychosis (almost 50%). In an Australian study[21] of 1,812 individuals with severe psychotic disorders, for those aged 18-24 years the rate of nicotine use was 70.6%. When adopting the same parameters, albeit over the past 3 months, the current study yields a rate of 62.6% among young people who are early in the course of their disorder.

The presence of an anxiety or mood disorder has been shown to be the largest determinant of treatment seeking in cannabis users, regardless of the level of use[22]. A recent study[23] utilising a cohort of Australian secondary school students, reported that by the time participants reached 29

years their daily cannabis use was significantly associated with an anxiety disorder. In the current study, frequent cannabis use was particularly common in females with an affective disorder, whereas for males other diagnoses (including psychosis and bipolar disorder) tended to be associated with increased rates of frequent use.

Amoung the subset of YMH patients (N=522) the prevalence of low-risk drinkers (34%) is the same as that predicted in the population[13]. However, the rates of risky (i.e. hazardous: 20%, harmful: 7% plus high-risk: 9%) YMH drinkers are substantially higher than in the general population (23%)[13]. Notably, other research[24, 25] has found that hazardous levels of alcohol use tends to peak in the 20-25 year age range suggesting that, if left untreated, there may be an escalation in problematic use in the risky drinking groups. With regards to risky drinking categories, key diagnostic groups (i.e. bipolar and psychosis) tended to have the higher rates of risky drinkers.

This study is limited by several factors. Firstly, the key substance use measures were self-report only and not confirmed by interview. Furthermore, participants were not asked about the amount of nicotine and cannabis use only the recent (past three month) frequency of use. Follow-up longitudinal studies of these patients would be important to determine the long-term patterns of such substance use. Despite these limitations, this study shows that frequent use of alcohol, nicotine or cannabis use in young people seeking mental health care is common. Given restricted legal access, and in comparison to their peers in the general population, the patterns of use in the YMH patients aged 12-17 years are particularly notable. Reductions in use of these substances needs to be prioritised within services provided to these at-risk young people.

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Table 1a: Recent (past 3 months) alcohol use in young (12 to 30 years) female (N=1116) and male (N=961) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
	Female		
Daily or almost daily	1.6% [9/553]	3.6% [7/196]	8.4% [31/367]
Weekly	11.2% [62/553]	33.7% [66/196]	31.3% [115/367]
Less than weekly	36.2% [200/553]	41.3% [81/196]	42.2% [155/367]
Never	51.0% [282/553]	21.4% [42/196]	18.0% [66/367]
	Males		
Daily or almost daily	1.4% [7/496]	9.3% [13/140]	15.4% [50/325]
Weekly	9.3% [46/496]	32.1% [45/140]	36.9% [120/325]
Less than weekly	32.7% [162/496]	43.6% [61/140]	35.4% [115/325]
Never	56.7% [281/496]	15.0% [21/140]	12.3% [40/325]

Note: Age-group categories were used to be consistent with 2010 National Drug Strategy Household Survey[13]

Table 1b: Recent (past 3 months) nicotine use in young (12 to 30 years) female (N=1119) and male (N=965) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
Females			
Daily or almost daily	23.0% [127/552]	32.0% [62/194]	34.6% [129/373]
Weekly	4.2% [23/552]	4.1% [8/194]	5.6% [21/373]
Less than weekly	12.9% [71/552]	17.0% [33/194]	12.9% [48/373]
Never	60.0% [331/552]	46.9% [91/194]	46.9% [175/373]
Males			
Daily or almost daily	23.1% [115/497]	40.9% [56/137]	48.0% [159/331]
Weekly	5.0% [25/497]	4.4% [6/137]	5.7% [19/331]
Less than weekly	9.7% [48/497]	5.8% [8/137]	10.6% [35/331]
Never	62.2% [309/497]	48.9% [67/137]	35.6% [118/331]

Table 1c: Recent (past 3 months) cannabis use in young (12 to 30 years) female (N=1096) and male (N=945) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
	Females		
Daily or almost daily	3.5% [19/540]	6.8% [13/190]	7.9% [29/366]
Weekly	2.2% [12/540]	3.7% [7/190]	6.3% [23/366]
Less than weekly	12.4% [67/540]	22.1% [42/190]	18.6% [68/366]
Never	81.9% [442/540]	67.4% [128/190]	67.2% [246/366]
	Males		
Daily or almost daily	3.7% [18/486]	11.5% [16/139]	14.4% [46/320]
Weekly	4.1% [20/486]	7.9% [11/139]	8.4% [27/320]
Less than weekly	13.8% [67/486]	14.4% [20/139]	16.9% [54/320]
Never	78.4% [381/486]	66.2% [92/139]	60.3% [193/320]

Table 2a: Proportion of 'at least weekly' use of alcohol across each diagnostic category in N=2077 young (12 to 30 years) female and male patients

	Females [N=290/1116]		Males [N=281/961]	
	Age	% at least weekly	Age	% at least weekly
Depression	20.3 ± 3.5	24.0% [115/480]	20.3 ± 3.2	31.2% [97/311]
Bipolar	21.8 ± 3.2	39.4% [43/109]	22.1 ± 2.6	39.2% [20/51]
Anxiety	19.1 ± 3.0	22.9% [50/218]	20.3 ± 2.3	20.1% [31/154]
Psychosis	20.6 ± 4.1	20.8% [10/48]	22.0 ± 3.8	40.8% [42/103]
Beh/Dev	16.5 ± 2.4	17.8% [13/73]	18.7 ± 3.6	18.3% [32/175]
Other	19.0 ± 2.9	34.9% [37/106]	19.7 ± 2.8	39.4% [39/99]
Unclear	18.7 ± 2.6	26.8% [22/82]	19.9 ± 3.3	29.4% [20/68]

Note: "Other" includes autistic spectrum, learning disorder, substance use disorders, and personality disorders.

Table 2b: Proportion of 'at least weekly' use of nicotine across each diagnostic category in N=2084 young (12 to 30 years) female and male patients

	Females [N=370/1119]		Males [N=380/965]	
	Age	% at least weekly	Age	% at least weekly
Depression	18.9 ± 3.1	30.5% [147/482]	19.2 ± 3.6	39.2% [122/311]
Bipolar	20.7 ± 3.2	44.5% [49/110]	20.6 ± 3.6	40.4% [21/52]
Anxiety	18.3 ± 3.1	24.9% [54/217]	19.6 ± 3.0	24.8% [38/153]
Psychosis	21.3 ± 4.6	37.5% [18/48]	21.7 ± 3.5	53.8% [56/104]
Beh/Dev	16.7 ± 3.2	41.1% [30/73]	17.0 ± 3.2	37.6% [67/178]
Other	18.9 ± 3.1	36.8% [39/106]	19.4 ± 3.0	45.9% [45/98]
Unclear	17.5 ± 2.7	39.8% [33/83]	18.6 ± 3.5	44.9% [31/69]

Note: "Other" includes autistic spectrum, learning disorder, substance use disorders, and personality disorders.

Table 2c: Proportion of 'at least weekly' use of cannabis across each diagnostic category in N=2041 young (12 to 30 years) female and male patients

	Females [N=103/1096]		Males [N=138/945]	
	Age	% at least weekly	Age	% at least weekly
Depression	19.7 ± 3.0	8.5% [40/471]	20.2 ± 3.4	14.3% [44/307]
Bipolar	22.3 ± 3.4	11.9% [13/109]	20.9 ± 2.6	15.4% [8/52]
Anxiety	18.6 ± 3.2	6.6% [14/211]	21.0 ± 2.5	7.3% [11/150]
Psychosis	21.0 ± 3.6	6.1% [3/49]	22.1 ± 3.9	17.5% [18/103]
Beh/Dev	18.4 ± 3.1	9.9% [7/71]	17.0 ± 2.6	11.6% [20/172]
Other	19.4 ± 3.0	17.1% [18/105]	19.2 ± 2.7	24.0% [23/96]
Unclear	18.1 ± 2.2	10.0% [8/80]	18.9 ± 3.4	21.5% [14/65]

Note: "Other" includes autistic spectrum, learning disorder, substance use disorders, and personality disorders.

Table 3: Demographics and level of functioning according to AUDIT drinking category in N = 522 young (12 to 30 years) patients

	Abstainers [N=159]	Low-risk [N=177]	Hazardous [N=104]	Harmful [N=36]	High-risk [N=46]
% females	46.5	53.7	54.8	47.2	39.1
Age	17.1 ± 4.1	21.1 ± 4.2	20.7 ± 3.8	21.6 ± 3.6	20.8 ± 4.2
Age, psychiatric onset	13.6 ± 4.3	16.3 ± 4.3	15.7 ± 3.9	16.3 ± 5.2	13.8 ± 3.5
SOFAS	58.9 ± 11.1	59.9 ± 11.9	62.7 ± 11.9	62.4 ± 12.2	57.6 ± 11.0

Table 4: Prevalence of AUDIT drinking categories within each psychiatric syndrome for N = 522 young (12 to 30 years) patients

	Age	% females	Abstainers [N=159]	Low-risk [N=177]	Hazardous [N=104]	Harmful [N=36]	High-risk [N=46]
Depression [N=192]	19.0 ± 4.1	62.0	29.7% (57)	33.9% (65)	21.4% (41)	6.2% (12)	8.9% (17)
Bipolar [N=105]	21.1 ± 3.7	68.6	15.2% (16)	38.1% (40)	26.7% (28)	8.6% (9)	11.4% (12)
Anxiety [N=45]	18.2 ± 4.3	42.2	44.4% (20)	26.7% (12)	15.6% (7)	8.9% (4)	4.4% (2)
Psychosis [N=108]	22.5 ± 4.0	28.7	31.5% (34)	36.1% (39)	18.5% (20)	7.4% (8)	6.5% (7)
Beh/Dev [N=46]	16.5 ± 4.1	23.9	50.0% (23)	26.1% (12)	10.9% (5)	2.2% (1)	10.9% (5)
Other [N=20]	18.5 ± 4.2	35.0	30.0% (6)	35.0% (7)	10.0% (2)	10.0% (2)	15.0% (3)
Unclear [N=6]	16.8 ± 4.0	33.3	50.0% (3)	33.3% (2)	16.7% (1)	0.0% (0)	0.0% (0)

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Competing interests statement

Dr Daniel Hermens is currently supported by a grant from the NSW Ministry of Health, Mental Health and Drug & Alcohol Office as well as an NHMRC Australia Fellowship (awarded to Professor Hickie). In 2007, he received honoraria for educational seminars from Janssen-Cilag.

Dr Elizabeth Scott is the (unpaid) Clinical Director of Headspace Services at the BMRI, the (unpaid) Co-ordinator of the Youth Mental Health Research Program at the BMRI, and Deputy Director of St Vincent's Private Hospital Young Adult Mental Health Unit. She has received honoraria for educational seminars related to the clinical management of depressive disorders supported by Servier and Eli-Lilly pharmaceuticals. She has participated in a national advisory board for the antidepressant compound Pristiq, manufactured by Pfizer.

Professor Hickie is a member of the Medical Advisory Panel for BUPA Health Insurance (Australia) and also a Board Member of Psychosis Australia Trust. From 2012, he is a Commissioner in Australia's new National Mental Health Commission. He was until January 2012 a director of headspace: the national youth mental health foundation. Prof Hickie was previously chief executive officer (till 2003) and clinical adviser (till 2006) of beyondblue, an Australian National Depression Initiative. He is supported principally for clinical research in depression and health services and population health initiatives related to anxiety and depression by a NHMRC Australian Medical Research Fellowship (2007-12). He has led projects for health professionals and the community supported by governmental, community agency and pharmaceutical industry partners (Wyeth, Eli Lily, Servier, Pfizer, AstraZeneca) for the identification and management of depression and anxiety. He has received honoraria for presentations of his own work at educational seminars supported by a number of non-government organisations and the pharmaceutical industry (including Pfizer, Servier and Astra Zeneca). He has served on advisory boards convened by the pharmaceutical industry in relation to specific antidepressants, including nefazodone, duloxetine, and desvenlafaxine. He leads a new investigator-initiated study of the effects of agomelatine on

circadian parameters (supported in part by Servier but also by other NHMRC funding) and has participated in a multicentre clinical trial of agomelatine effects on sleep architecture in depression and a Servier-supported study of major depression and sleep disturbance in primary care settings. In addition to national and international Government-based grant bodies, investigator-initiated mental health research at the BMRI he has been supported by various pharmaceutical manufacturers (including Servier and Pfizer) and not-for-profit entities (including the Heart Foundation, beyondblue and the BUPA Foundation).

Author contributions

DFH, EMS, SLN & IBH designed the study and wrote the protocol. DFH and ML reviewed the literature; DH, DW & ML conducted the statistical analyses. DFH, ML, DW & IBH drafted the manuscript. DH, DW, BW and SN were involved in study coordination, administration of neuropsychological and data analyses. JL & BW contributed to the study interpretation and drafts of the manuscript. All authors contributed to and have approved the final manuscript.

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Frequent alcohol, nicotine or cannabis use is common in young persons presenting for mental health care: a cross-sectional study

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Frequent alcohol, nicotine or cannabis use is common in young persons presenting for mental health care: a cross-sectional study

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Abstract

Objectives: To determine the prevalence of recent alcohol, nicotine or cannabis use in young persons presenting for mental health care.

Design: A cross-sectional study of young people seeking mental health care completed self-report questionnaires regarding their use of alcohol, nicotine or cannabis.

Setting: Data were collected from two sites as part of the national *headspace* services program.

Participants: 2,122 young people age 12 to 30 years provided information as part of a patient register; a subset of N=522 participants also provided more detailed information about their patterns of alcohol use.

Outcome measures: Prevalence levels of recent alcohol, nicotine or cannabis use within relevant age bands (12-17, 18-19 and 20-30) or primary diagnostic categories.

Results: The rates for use *at least weekly* of alcohol for the three age bands were 12%, 39% and 45%, and for cannabis 7%, 14% and 18%, respectively. The rates of *daily* nicotine use for the three age bands were 23%, 36% and 41%. The pattern of alcohol use was characterised by few abstainers as well as many risky drinkers. Age of onset across all three substances was approximately 15 years. Individuals who used any of the three substances more frequently were likely to be older, male or have psychotic or bipolar disorders.

Conclusions: Frequent use of alcohol, nicotine or cannabis use in young people seeking mental health care is common. Given restricted legal access, the patterns of use in those aged 12-17 years are particularly notable. Reductions in substance use needs to be prioritised within services for at-risk young people.

Article summary

Article focus:

- Previous studies indicate that early substance misuse increases the risk of developing a mental illness;
- Early onset mental disorders are associated with increased risk of alcohol or other substance misuse;
- In this study, we determined the rates of alcohol, nicotine or cannabis use in young persons (aged 12 to 30 years) entering mental health care.

Key messages:

- Alcohol, nicotine or cannabis uses in young people who present for mental health care are common and frequent;
- Given the comorbidity with significant mental health problems, these patterns of frequent substance use are likely to contribute to increased risk of poor physical and/or mental health outcomes;
- Reductions in use of these substances needs to be prioritised within services provided to these at-risk young people.

Strengths and limitations of this study:

- A cross-sectional study of a large number of young persons seeking mental health care;
- Findings in the 12 to 17 year old age group are particularly novel;
- Key substance use measures were self-report only and not confirmed by interview;
- Participants were not asked about the amount of nicotine and cannabis use.

Introduction

Health prevention priorities in Australia include cessation of nicotine or cannabis use and reduction in alcohol-related harm[1-3]. Among those with mental illness, reductions in substance use-related harm and improved cardiovascular health are key clinical objectives. Epidemiological and longitudinal studies indicate that early substance misuse increases the risk of developing a mental illness and, conversely, early onset mental disorders are associated with increased risk of alcohol or other substance misuse[4-6].

Neurobiological studies increasingly demonstrate the adverse effects of alcohol or cannabis on brain development in teenagers and young adults[7]. Young people with mental disorders are at increased risk of later cardiovascular disease[8]. One of the most significant modifiable risk factors in this population appears to be cigarette smoking.

Within the new primary-care based mental health initiative, *headspace*: the national youth mental health foundation, a strong policy emphasis is placed on active management of alcohol or other substance-misuse problems. While it is clear that these new centres have the capacity to engage young people, the extent to which concurrent alcohol, nicotine or other substance misuse is being actively managed is yet to be identified.

From a physical health perspective, there is an urgent need to establish an early intervention agenda for these individuals who are at high risk of premature death or physical health morbidity from a range of medical conditions. Of particular note are the high rates of premature death due to cardiovascular disease in persons with depression and the prevalence of metabolic syndrome in those receiving treatments for major mood disorders. Additionally, the high rate of nicotine and cannabis use in young people with major mental health disorders puts them at risk of other smoking-related conditions.

From a mental health perspective, there is a need to better understand the early stages of substance misuse in young people with emerging mental disorders. The identification of substance use onset and subsequent patterns of use in such young people would help early intervention approaches. In this study, we determined the rates of alcohol, nicotine or cannabis use in young persons entering mental health care. Additionally, we sought to assess the patterns of comorbidity with specific mental disorders.

Methods

Participants aged 16 years or older provided their own written informed consent and parental/guardian consent was obtained for those under 16 years. The University of Sydney Human Research Ethics Committee approved the study.

Sample: Participants were recruited from two *headspace*[9] sites: (i) the Brain & Mind Research Institute, Camperdown; and (ii) Campbelltown (outer suburban, south-western Sydney). These services specialise in the assessment and early intervention of mental health problems in young people[10, 11]. Subjects in this study were included if they were: (i) accessing services at one of the above-mentioned *headspace* sites; (ii) between the ages of 12 and 30 years; (iii) and consented to be enrolled on a patient register. Participants were excluded if they did not have sufficient English-language skills. Thus, this study utilised data obtained from 2,122 young people (12 to 30 years) who consecutively volunteered to enter the patient register between October 2007 and June 2012. A subset of 522 participants also took part in specialised neurobiological research related to clinical outcomes. Hereafter, the entire sample (N=2,112) is referred to as the 'Youth Mental Health' (YMH) cohort. Referring clinicians were asked to determine primary and secondary diagnoses based on DSM-IV criteria. For the purposes of categorisation, clinicians were asked to select one of the following 'primary diagnosis' disorders: (i) 'depression'; (ii) 'bipolar'; (iii) 'anxiety' (including obsessive compulsive, generalised anxiety, agoraphobia/panic and social anxiety disorders); (iv)

'psychosis' (including first episode and schizophrenia); (v) 'behavioural/developmental' (including attention-deficit hyperactivity, conduct, oppositional defiance and impulse control disorders); (vi) 'substance use'; (vii) 'personality'; (viii) 'eating disorder'; (ix) 'autism spectrum'; (x) 'other'; and (xi) 'unclear, still assessing'.

Assessment: Clinical information was obtained via: (i) brief self-report questionnaire; and (ii) clinical assessment (detailed methods have been described previously[10, 11]).

Self-report: The questionnaire comprised basic demographic data as well as standardised questionnaires to measure common symptoms, psychosocial functioning, disability and vocational status upon entry to the service (findings reported previously[10, 11]). Participants were asked about their lifetime and current substance use using the first two items of the World Health Organization's 'alcohol, smoking and substance involvement screening test' (WHO-ASSIST)[12]. In item 1, participants were asked whether they ever used: (a) tobacco (nicotine) products; (b) alcoholic beverages; or, (c) cannabis. Subsequently, item 2 asked whether their use of each substance in the *past 3 months* was: (a) 'never'; (b) 'once or twice'; (c) 'monthly'; (d) 'weekly'; (e) 'daily or almost daily'.

Data Reduction: As a means to compare recent alcohol, nicotine or cannabis use in the YMH cohort with that of the general population the WHO-ASSIST item 2 data were re-categorised to align with the age bands and use categories of the 2010 National Drug Strategy Household Survey (NDSHS)[13]. Thus, responses were re-categorised as: (i) 'daily or almost daily'; (ii) 'weekly'; (iii) 'less than weekly' or (iv) 'never'. That is, responses of 'once or twice' and 'monthly' were collapsed to form the 'less than weekly' category. Furthermore, the YMH cohort was stratified into three age groups: (i) 12 to 17 years; (ii) 18 to 19 years; and (iii) 20 to 30 years.

Clinical assessment: Undertaken by psychiatrists, psychologists, mental health nurses or general practitioners with training in mental health. The assessing clinician verified key aspects such as

primary and secondary diagnoses/comorbidities, vocational status, medical comorbidity and general functioning via the social and occupational function assessment scale (SOFAS)[14].

Detailed assessment of alcohol use: For the sub-sample (N=522) only, the Alcohol Use Disorders Identification Test (AUDIT) was used to assess each participant's level of risky drinking in the past year, as well as their lifetime familiarity[15, 16]. Total scores range of from 0-40, with a higher score indicating more problematic drinking. A total score of 1 to 7 is indicative of low risk drinking; total scores 8-15 indicate 'risky drinking' with a moderate risk of harm; 16-19 indicating a high-risk or 'harmful' level of alcohol consumption, and 20-40 indicates a 'high-risk' level.

Statistical Analyses: Statistics were performed using SPSS for Windows 20.0. Group differences in demographic and clinical variables were assessed via analysis of variance (ANOVA) or chi-square tests. To determine whether age was a contributing factor to any observed differences in the prevalences of recent substance use, logistic regressions were conducted with a dichotomous dependent variable of substance use (e.g. 'at least weekly' versus 'less than weekly') and with diagnosis and age (and their interaction) entered as predictor variables. The forced entry method was employed and significant regression models were only accepted if the Hosmer-Lemeshow goodness-of-fit statistic was non-significant.

Results

Lifetime use

Among males, three quarters (75.9%; 506/667) of respondents (12 to 30 yrs) reported a lifetime use of alcohol, 63.3% (401/633) a lifetime use of nicotine and more than half (57.9%; 390/673) a lifetime use of cannabis. Similarly, for females, the lifetime rates were 75.6% (573/758), 60.3% (290/440) and 51.3% (391/762), respectively.

Age of first use

For males, the self-reported 'age of first use' for each substance was as follows: (i) alcohol = 14.6 ± 2.4 yrs (N=456); (ii) nicotine = 14.0 ± 2.6 yrs (N=385); and (iii) cannabis = 14.8 ± 2.9 yrs (N=127). For females, the age of first use for each substance was: (i) alcohol = 14.6 ± 2.3 yrs (N=531); (ii) nicotine = 14.2 ± 2.4 yrs (N=414); and (iii) cannabis = 15.6 ± 3.0 yrs (N=126). The age of first use of cannabis was significantly earlier in males [$F(1, 252)=5.7$, $p<.05$].

Recent use

The prevalence of each category of alcohol use increased with age (see Table 1a). The prevalence of daily and weekly drinking in the youngest (12-17 yrs) group was notable (almost 13%). In terms of sex differences, the most substantial differences were the increased rates of daily alcohol use in males in the 18-19 yrs and 20-29 yrs age groups (9.3% vs. 3.6% and 15.4% vs. 8.4%, respectively).

Almost one quarter (23.1%) of the younger group (12-17 yrs) used nicotine daily (see Table 1b). For the older groups the rates were 36 and 41%, respectively. While there were no substantial differences between younger (12-17 yr old) females and males in recent nicotine use, in the older groups, the proportion of daily nicotine use was higher in males (40.9% vs. 32.0% for 18-19 yrs; 48.0% vs. 34.6% for 20-30 yrs).

Notably, for the two younger groups (12-17 yrs and 18-19 yrs), the prevalence of daily cannabis use (see Table 1c) was higher than that for daily alcohol use (3.6% vs. 1.5% and 8.8% vs. 6.0%). Almost 20% of the 12-17 yrs group used cannabis at least once in past 3 months compared to more than 30% of the two older groups (33.1% and 36.0%, respectively). As with alcohol and nicotine, the males in two the older age groups were more likely to report using cannabis daily.

In terms of combined substance use, across the entire sample, 17.8% (367/2063) of cases reported 'at least weekly' use of both alcohol and tobacco; this combination was more common in males (at 20.5%; 196/954) as compared to females (15.4%; 171/1109). Similarly, the 'at least weekly' use of: (i) alcohol and cannabis; and (ii) nicotine and cannabis was higher in males (8.5% and 12.9%, respectively) compared to females (5.7% and 8.8%, respectively). Notably, the combination of all three substances used 'at least weekly' was at 5.4% in females (59/1096) and at 7.9% in males (75/945).

The relationships between substance and primary diagnostic categories are shown in Tables 2a, 2b and 2c. Due to some limitations (e.g. unequal sample sizes) and to facilitate interpretation, ANOVA and regression analyses included only the first five diagnostic categories (i.e. depression, bipolar, anxiety, psychosis and behavioural/developmental). Across the five diagnostic groups, there were significant main effects of age for the 'at least weekly' alcohol drinkers in both females [$F(4,229)=7.9$, $p<.001$] and males [$F(4,221)=5.9$, $p<.001$]; the behavioural/developmental group was the youngest in both. Despite sex, those with a primary diagnosis of a bipolar spectrum disorder were the most likely to report at least weekly use of alcohol (at 39.4%). Compared to females, within the depression and psychosis groups, young males reported more frequent use of alcohol.

There were significant main effects of age across the five diagnostic groups for both female [$F(4,297)=10.0$, $p<.001$] and male [$F(4,297)=14.7$, $p<.001$] 'at least weekly' users of nicotine. Despite sex, the rate of 'at least weekly' use of nicotine was above 30% for four of the five main diagnostic categories, with psychosis having the highest rate at 48.7%. The greatest difference between the sexes in terms of rates of 'at least weekly' nicotine use was seen in the psychosis group (37.5% of females vs. 53.8% of males).

There were significant main effects of age across the five diagnostic groups for both female [F(4,76)=3.0, p<.001] and male [F(4,99)=5.9, p<.001] 'at least weekly' cannabis users. Across all of the diagnostic groups males were more likely to be weekly cannabis users. The group with the highest prevalence of weekly cannabis use was males with 'psychosis', at 17.5%.

Among the remaining six diagnostic groups (see Tables 2a, 2b and 2c) the 'substance use' group, as expected, showed the highest levels of 'at least weekly' use of alcohol, nicotine and cannabis. Of note, over 63% of males with a personality disorder reported at least weekly nicotine use, compared to 46% of females. Interestingly, those with 'unclear' diagnoses showed moderately high prevalences of 'at least weekly' use across all three substances.

Logistic Regression Models

In females, for nicotine, the significant model [χ^2 (9)=40.9, p<.001] included only age as a significant predictor (p<.01). Similarly, for cannabis, the model [χ^2 (9)=21.7, p=.01] only included age (p<.05). In both models, as indicated by the beta coefficients for age (0.334 and 0.308, respectively), 'at least weekly' users were older. The regression model for current alcohol use in females was not acceptable (at p<.01). In males, for nicotine, the highly significant model [χ2 (9)=83.8, p<.001] included age (p<.001), diagnosis (p<.01) and age-by-diagnosis (p<.01) as predictors. For cannabis the model [χ2 (13)=59.5, p<.001] only included age (p<.01). As seen in females, the beta coefficients for age were positive in both models (0.265 and 0.162, respectively) indicating that 'at least weekly' users were older and, in the case of tobacco, more likely to be of a particular diagnosis (i.e. psychosis; see Table 2b). The regression model for current alcohol use in males was not acceptable (at p<.01).

Detailed alcohol use

Table 3 displays the demographics and social-occupational functioning of the subset (N=522) sample. As predicted, abstainers (N=159) were the youngest group; ANOVA comparing age across the five drinking categories was highly significant [$F(4,521)=27.1$, $p<.001$]. Scheffe's post-hoc tests confirmed that only the abstainers group significantly ($p<.001$) differed (in age) from any other group. After omitting the abstainers, there were no significant differences across the four drinking categories in terms of distribution of gender or age, however there was a difference in age of psychiatric onset [$F(3,289)=3.2$, $p<.05$].

Table 4 displays the proportions of individuals across the alcohol use categories by each primary diagnosis group. As above, ANOVA and regression analyses only included the first five diagnostic groups (see Table 4). As observed in the larger sample, the five groups were found to differ in mean age [$F(4,493)=25.4$, $p<.001$]. In terms of 'risky' drinking (i.e. hazardous or harmful or high-risk) the five diagnostic groups differed with the bipolar group having the largest proportion (46.7%) and the behavioural/developmental group having the lowest proportions of 'risky' drinkers (25.1%). A logistic regression with the dependent variable being 'no or low-risk' drinking (i.e. abstainers and low-risk) versus 'risky' (the remaining three categories) was found to show acceptable goodness-of-fit and a significant model [$\chi^2(9)=27.0$, $p<.001$] however there were no significant predictors (age, diagnosis, age by diagnosis).

Discussion

Despite adolescence being the peak period for the onset of both mental and substance misuse disorders, primary care based studies indicate these problems are not being effectively managed in young people. National community-based surveys have indicated the extent to which young people do not access care for either mental disorders or alcohol/substance misuse, and this lack of care is most evident for young men and for those with alcohol/substance misuse[17].

This is the first study to examine substance use patterns in a large sample (2000+) of young people accessing *headspace* services (albeit across two sites within the metropolitan of Sydney). The data presented here demonstrates that among young people who present for mental health care within the *headspace* network, alcohol, nicotine or cannabis uses are common. Given the comorbidity with significant mental health problems, these patterns of substance use are likely to contribute to increased risk of poor physical and/or mental health outcomes. Future studies will help to determine the representativeness of these data by evaluating other samples (currently there are more than 40 *headspace* sites nationally).

Compared to their age-matched peers in the general population (i.e. based on the findings of the 2010 NDSHS[13]) the patients in this study showed some differences in the rates of current substance use. Of note, our youngest group (12-17 yrs) was twice as likely to report weekly alcohol use compared to 12-17 year olds in the general population (i.e. 10.3% vs. 5.1%; see table 4.3 in[13]). These comparisons should be treated somewhat cautiously as the NDSHS[13] determined frequency of use over the past 12 months whereas our study assessed the past 3 months; furthermore, the NDSHS evaluated 'daily' use whereas we asked about 'daily or almost daily' use. Noting such limitations, 'daily' alcohol use in our YMH samples was at least three times greater than that observed in the general population (i.e. across the age groups;[13]). Similarly, 'daily' nicotine use in our YMH samples is at least twice as high as the general population estimates (again across the three age groups; see table 3.3 in[13]). With regards to 'any' recent cannabis use, our older YMH samples (i.e. 18-19 yrs and 20-30 yrs) were 1.5 times more likely to report recent cannabis use compared to their peers in the general population (see table 6.4 in[13]).

In this study, the relationships between recent substance use and diagnosis were complex, and were mainly affected by both age and gender. The logistic regressions models for nicotine or cannabis use were acceptable and in three of these models, only age was a significant predictor of weekly use; the exception being nicotine use in males where age and diagnosis both contributed. The

difference in the prevalences of weekly nicotine use among males with an anxiety disorder as compared to males with a psychotic disorder is notable. In general, weekly substance use appeared to be more likely if an individual was an older male and diagnosed with psychosis or bipolar disorder.

Information regarding the prevalence of frequent substance use among younger people seeking mental health care is limited. There is a general consensus that substance misuse in individuals with a mental disorder is common[6, 18, 19], particularly in treatment seeking populations; with evidence to suggest that 'problematic substance use is the most common comorbid condition among people with a major mental illness and is associated with poorer patient outcomes'[20]. In a large cross-sectional study of over 45,000 Australians attending primary care, 12% of respondents were identified as having any mental disorder with concurrent substance misuse[18].

Previous research has tended to evaluate the comorbidity of mental- and substance use- disorder in broad adult samples (i.e. "18 and above"). Despite this, key associations we have observed in the current YMH cohort are consistent with those observed in the literature. For example, a study of over 40,000 adults in the US found that comorbid substance use and mood/anxiety disorders are among the most prevalent of psychiatric disorders[21]; and notably, that bipolar disorders were more strongly related to the substance use disorders than any other mood or anxiety disorder. Similarly, other population based studies have demonstrated stronger associations between psychosis and nicotine[22] or cannabis use[23].

Of considerable relevance to preventing later poor physical health, at least weekly nicotine use was highly prevalent in those with psychosis (almost 50%). In an Australian study[24] of 1,812 individuals with severe psychotic disorders, for those aged 18-24 years the rate of nicotine use was 70.6%. When adopting the same parameters, albeit over the past 3 months, the current study yields a rate of 62.6% among young people who are early in the course of their disorder.

The presence of an anxiety or mood disorder has been shown to be the largest determinant of treatment seeking in cannabis users, regardless of the level of use[22]. A recent study[25] utilising a cohort of Australian secondary school students, reported that by the time participants reached 29 years their daily cannabis use was significantly associated with an anxiety disorder. In the current study, frequent cannabis use was particularly common in females with an affective disorder, whereas for males other diagnoses (including psychosis and bipolar disorder) tended to be associated with increased rates of frequent use.

Amoung the subset of YMH patients (N=522) the prevalence of low-risk drinkers (34%) is the same as that predicted in the population[13]. However, the rates of risky (i.e. hazardous: 20%, harmful: 7% plus high-risk: 9%) YMH drinkers are substantially higher than in the general population (23%)[13]. Notably, other research[26, 27] has found that hazardous levels of alcohol use tends to peak in the 20-25 year age range suggesting that, if left untreated, there may be an escalation in problematic use in the risky drinking groups. With regards to risky drinking categories, key diagnostic groups (i.e. bipolar and psychosis) tended to have the higher rates of risky drinkers.

This study is limited by several factors. Firstly, the key substance use measures were self-report only and not confirmed by interview. Furthermore, participants were not asked about the amount of nicotine and cannabis use only the recent (past three month) frequency of use. Follow-up longitudinal studies of these patients would be important to determine the long-term patterns of such substance use. Despite these limitations, this study shows that frequent use of alcohol, nicotine or cannabis use in young people seeking mental health care is common. Given restricted legal access, and in comparison to their peers in the general population, the patterns of use in the YMH patients aged 12-17 years are particularly notable. Reductions in use of these substances needs to be prioritised within services provided to these at-risk young people. Traditionally, mental health services have been separate to interventions that target substance use, however, there are growing

suggestions that complex young people (with comorbid mental health and substance use problems) would be most receptive to integrated rather than sequential or parallel approaches[28, 29].

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Table 1a: Recent (past 3 months) alcohol use in young (12 to 30 years) female (N=1116) and male (N=961) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
	Female		
Daily or almost daily	1.6% [9/553]	3.6% [7/196]	8.4% [31/367]
Weekly	11.2% [62/553]	33.7% [66/196]	31.3% [115/367]
Less than weekly	36.2% [200/553]	41.3% [81/196]	42.2% [155/367]
Never	51.0% [282/553]	21.4% [42/196]	18.0% [66/367]
	Males		
Daily or almost daily	1.4% [7/496]	9.3% [13/140]	15.4% [50/325]
Weekly	9.3% [46/496]	32.1% [45/140]	36.9% [120/325]
Less than weekly	32.7% [162/496]	43.6% [61/140]	35.4% [115/325]
Never	56.7% [281/496]	15.0% [21/140]	12.3% [40/325]

Note: Age-group categories were used to be consistent with 2010 National Drug Strategy Household Survey[13]

Table 1b: Recent (past 3 months) nicotine use in young (12 to 30 years) female (N=1119) and male (N=965) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
Females			
Daily or almost daily	23.0% [127/552]	32.0% [62/194]	34.6% [129/373]
Weekly	4.2% [23/552]	4.1% [8/194]	5.6% [21/373]
Less than weekly	12.9% [71/552]	17.0% [33/194]	12.9% [48/373]
Never	60.0% [331/552]	46.9% [91/194]	46.9% [175/373]
Males			
Daily or almost daily	23.1% [115/497]	40.9% [56/137]	48.0% [159/331]
Weekly	5.0% [25/497]	4.4% [6/137]	5.7% [19/331]
Less than weekly	9.7% [48/497]	5.8% [8/137]	10.6% [35/331]
Never	62.2% [309/497]	48.9% [67/137]	35.6% [118/331]

Table 1c: Recent (past 3 months) cannabis use in young (12 to 30 years) female (N=1096) and male (N=945) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
Females			
Daily or almost daily	3.5% [19/540]	6.8% [13/190]	7.9% [29/366]
Weekly	2.2% [12/540]	3.7% [7/190]	6.3% [23/366]
Less than weekly	12.4% [67/540]	22.1% [42/190]	18.6% [68/366]
Never	81.9% [442/540]	67.4% [128/190]	67.2% [246/366]
Males			
Daily or almost daily	3.7% [18/486]	11.5% [16/139]	14.4% [46/320]
Weekly	4.1% [20/486]	7.9% [11/139]	8.4% [27/320]
Less than weekly	13.8% [67/486]	14.4% [20/139]	16.9% [54/320]
Never	78.4% [381/486]	66.2% [92/139]	60.3% [193/320]

Table 2a: Proportion of 'at least weekly' use of alcohol across each diagnostic category in N=2077 young (12 to 30 years) female and male patients

	Females [N=290/1116]		Males [N=281/961]	
	Age	% at least weekly	Age	% at least weekly
Depression	20.3 ± 3.5	24.0% [115/480]	20.3 ± 3.2	31.2% [97/311]
Bipolar	21.8 ± 3.2	39.4% [43/109]	22.1 ± 2.6	39.2% [20/51]
Anxiety	19.1 ± 3.0	22.9% [50/218]	20.3 ± 2.3	20.1% [31/154]
Psychosis	20.6 ± 4.1	20.8% [10/48]	22.0 ± 3.8	40.8% [42/103]
Beh/Dev	16.3 ± 2.4	17.4% [12/69]	18.7 ± 3.6	20.0% [32/160]
Substance Use	19.8 ± 3.1	92.3% [12/13]	19.1 ± 2.8	63.0% [17/27]
Personality	19.0 ± 3.1	37.5% [9/24]	17.2 ± 1.5	36.4% [4/11]
Eating Disorder	19.6 ± 2.3	27.8% [5/18]	19.5 ± 0.7	40.0% [2/5]
Autistic Spectrum	19.0	25.0% [1/4]	19.0	5.5% [1/18]
Other	17.9 ± 2.9	21.6% [11/51]	21.1 ± 2.8	28.3% [15/53]
Unclear	18.7 ± 2.6	26.8% [22/82]	19.9 ± 3.3	29.4% [20/68]

Note: "Beh/Dev" = behavioural/developmental

Table 2b: Proportion of 'at least weekly' use of nicotine across each diagnostic category in N=2084 young (12 to 30 years) female and male patients

	Females [N=370/1119]		Males [N=380/965]	
	Age	% at least weekly	Age	% at least weekly
Depression	18.9 ± 3.1	30.5% [147/482]	19.2 ± 3.6	39.2% [122/311]
Bipolar	20.7 ± 3.2	44.5% [49/110]	20.6 ± 3.6	40.4% [21/52]
Anxiety	18.3 ± 3.1	24.9% [54/217]	19.6 ± 3.0	24.8% [38/153]
Psychosis	21.3 ± 4.6	37.5% [18/48]	21.7 ± 3.5	53.8% [56/104]
Beh/Dev	16.7 ± 3.2	43.5% [30/69]	17.0 ± 3.2	39.9% [65/163]
Substance Use	19.8 ± 3.2	84.6% [11/13]	19.3 ± 2.8	70.4% [19/27]
Personality	18.1 ± 3.1	45.8% [11/24]	18.4 ± 3.2	63.6% [7/11]
Eating Disorder	20.0 ± 1.7	17.6% [3/17]	19.5 ± 0.7	40.0% [2/5]
Autistic Spectrum	na	na	15.7 ± 3.0	16.7% [3/18]
Other	18.6 ± 3.3	26.9% [14/52]	19.9 ± 3.5	30.8% [16/52]
Unclear	17.5 ± 2.7	39.8% [33/83]	18.6 ± 3.5	44.9% [31/69]

Note: "Beh/Dev" = behavioural/developmental

Table 2c: Proportion of 'at least weekly' use of cannabis across each diagnostic category in N=2041 young (12 to 30 years) female and male patients

	Females [N=103/1096]		Males [N=138/945]	
	Age	% at least weekly	Age	% at least weekly
Depression	19.7 ± 3.0	8.5% [40/471]	20.2 ± 3.4	14.3% [44/307]
Bipolar	22.3 ± 3.4	11.9% [13/109]	20.9 ± 2.6	15.4% [8/52]
Anxiety	18.6 ± 3.2	6.6% [14/211]	21.0 ± 2.5	7.3% [11/150]
Psychosis	21.0 ± 3.6	6.1% [3/49]	22.1 ± 3.9	17.5% [18/103]
Beh/Dev	18.4 ± 3.1	10.4% [7/67]	17.3 ± 2.4	12.1% [19/157]
Substance Use	19.0 ± 2.9	61.5% [8/13]	18.7 ± 2.0	56.0% [14/25]
Personality	19.2 ± 3.7	16.7% [4/24]	21.5 ± 4.9	18.2% [2/11]
Eating Disorder	20.0 ± 1.7	17.6% [3/17]	na	na
Autistic Spectrum	na	na	16.0 ± 4.2	11.1% [2/18]
Other	20.0 ± 1.7	5.9% [3/51]	19.7 ± 3.7	11.5% [6/52]
Unclear	18.1 ± 2.2	10.0% [8/80]	18.9 ± 3.4	21.5% [14/65]

Note: "Beh/Dev" = behavioural/developmental

Table 3: Demographics and level of functioning according to AUDIT drinking category in N = 522 young (12 to 30 years) patients

	Abstainers [N=159]	Low-risk [N=177]	Hazardous [N=104]	Harmful [N=36]	High-risk [N=46]
% females	46.5	53.7	54.8	47.2	39.1
Age	17.1 ± 4.1	21.1 ± 4.2	20.7 ± 3.8	21.6 ± 3.6	20.8 ± 4.2
Age, psychiatric onset	13.6 ± 4.3	16.3 ± 4.3	15.7 ± 3.9	16.3 ± 5.2	13.8 ± 3.5
SOFAS	58.9 ± 11.1	59.9 ± 11.9	62.7 ± 11.9	62.4 ± 12.2	57.6 ± 11.0

Note: AUDIT = alcohol use disorder identification test

Table 4: Prevalence of AUDIT drinking categories within each psychiatric syndrome for N = 522 young (12 to 30 years) patients

	Age	% females	Abstainers [N=159]	Low-risk [N=177]	Hazardous [N=104]	Harmful [N=36]	High-risk [N=46]
Depression [N=192]	19.0 ± 4.1	62.0	29.7% (57)	33.9% (65)	21.4% (41)	6.2% (12)	8.9% (17)
Bipolar [N=105]	21.1 ± 3.7	68.6	15.2% (16)	38.1% (40)	26.7% (28)	8.6% (9)	11.4% (12)
Anxiety [N=45]	18.2 ± 4.3	42.2	44.4% (20)	26.7% (12)	15.6% (7)	8.9% (4)	4.4% (2)
Psychosis [N=108]	22.5 ± 4.0	28.7	31.5% (34)	36.1% (39)	18.5% (20)	7.4% (8)	6.5% (7)
Beh/Dev [N=44]	16.7 ± 4.1	25.0	47.7% (21)	27.3% (12)	11.4% (5)	2.3% (1)	11.4% (5)
Subst. Use [N=1]	26.0	0.0	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (1)	0.0% (0)
Autistic Spect. [N=5]	15.8 ± 2.3	0.0	60.0% (3)	20.0% (1)	0.0% (0)	0.0% (0)	20.0% (1)
Other [N=16]	18.4 ± 4.1	43.8	31.2% (5)	37.5% (6)	12.5% (2)	6.2% (2)	12.5% (2)
Unclear [N=6]	16.8 ± 4.0	33.3	50.0% (3)	33.3% (2)	16.7% (1)	0.0% (0)	0.0% (0)

Note: AUDIT = alcohol use disorder identification test; “Beh/Dev” = behavioural/developmental

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Competing interests statement

Dr Daniel Hermens is currently supported by a grant from the NSW Ministry of Health, Mental Health and Drug & Alcohol Office as well as an NHMRC Australia Fellowship (awarded to Professor Hickie). In 2007, he received honoraria for educational seminars from Janssen-Cilag.

Dr Elizabeth Scott is the (unpaid) Clinical Director of Headspace Services at the BMRI, the (unpaid) Co-ordinator of the Youth Mental Health Research Program at the BMRI, and Deputy Director of St Vincent's Private Hospital Young Adult Mental Health Unit. She has received honoraria for educational seminars related to the clinical management of depressive disorders supported by Servier and Eli-Lilly pharmaceuticals. She has participated in a national advisory board for the antidepressant compound Pristiq, manufactured by Pfizer.

Professor Hickie is a member of the Medical Advisory Panel for BUPA Health Insurance (Australia) and also a Board Member of Psychosis Australia Trust. From 2012, he is a Commissioner in Australia's new National Mental Health Commission. He was until January 2012 a director of headspace: the national youth mental health foundation. Prof Hickie was previously chief executive officer (till 2003) and clinical adviser (till 2006) of beyondblue, an Australian National Depression Initiative. He is supported principally for clinical research in depression and health services and population health initiatives related to anxiety and depression by a NHMRC Australian Medical Research Fellowship (2007-12). He has led projects for health professionals and the community supported by governmental, community agency and pharmaceutical industry partners (Wyeth, Eli Lily, Servier, Pfizer, AstraZeneca) for the identification and management of depression and anxiety. He

has received honoraria for presentations of his own work at educational seminars supported by a number of non-government organisations and the pharmaceutical industry (including Pfizer, Servier and Astra Zeneca). He has served on advisory boards convened by the pharmaceutical industry in relation to specific antidepressants, including nefazodone, duloxetine, and desvenlafaxine. He leads a new investigator-initiated study of the effects of agomelatine on circadian parameters (supported in part by Servier but also by other NHMRC funding) and has participated in a multicentre clinical trial of agomelatine effects on sleep architecture in depression and a Servier-supported study of major depression and sleep disturbance in primary care settings. In addition to national and international Government-based grant bodies, investigator-initiated mental health research at the BMRI he has been supported by various pharmaceutical manufacturers (including Servier and Pfizer) and not-for-profit entities (including the Heart Foundation, beyondblue and the BUPA Foundation).

Author contributions

DFH, EMS, SLN & IBH designed the study and wrote the protocol. DFH and ML reviewed the literature; DH, DW & ML conducted the statistical analyses. DFH, ML, DW & IBH drafted the manuscript. DH, DW, BW and SN were involved in study coordination, administration of neuropsychological and data analyses. JL & BW contributed to the study interpretation and drafts of the manuscript. All authors contributed to and have approved the final manuscript.

Frequent alcohol, nicotine or cannabis use is common in young persons presenting for mental health care: a cross-sectional study

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Abstract

Objectives: To determine the prevalence of recent alcohol, nicotine or cannabis use in young persons presenting for mental health care.

Design: A cross-sectional study of young people seeking mental health care completed self-report questionnaires regarding their use of alcohol, nicotine or cannabis.

Setting: Data were collected from two sites as part of the national *headspace* services program.

Participants: 2,122 young people age 12 to 30 years provided information as part of a patient register; a subset of N=522 participants also provided more detailed information about their patterns of alcohol use.

Outcome measures: Prevalence levels of recent alcohol, nicotine or cannabis use within relevant age bands (12-17, 18-19 and 20-30) or primary diagnostic categories.

Results: The rates for use *at least weekly* of alcohol for the three age bands were 12%, 39% and 45%, and for cannabis 7%, 14% and 18%, respectively. The rates of *daily* nicotine use for the three age bands were 23%, 36% and 41%. The pattern of alcohol use was characterised by few abstainers as well as many risky drinkers. Age of onset across all three substances was approximately 15 years. Individuals who used any of the three substances more frequently were likely to be older, male or have psychotic or bipolar disorders.

Conclusions: Frequent use of alcohol, nicotine or cannabis use in young people seeking mental health care is common. Given restricted legal access, the patterns of use in those aged 12-17 years are particularly notable. Reductions in substance use needs to be prioritised within services for at-risk young people.

Article summary

Article focus:

- Previous studies indicate that early substance misuse increases the risk of developing a mental illness;
- Early onset mental disorders are associated with increased risk of alcohol or other substance misuse;
- In this study, we determined the rates of alcohol, nicotine or cannabis use in young persons (aged 12 to 30 years) entering mental health care.

Key messages:

- Alcohol, nicotine or cannabis uses in young people who present for mental health care are common and frequent;
- Given the comorbidity with significant mental health problems, these patterns of frequent substance use are likely to contribute to increased risk of poor physical and/or mental health outcomes;
- Reductions in use of these substances needs to be prioritised within services provided to these at-risk young people.

Strengths and limitations of this study:

- A cross-sectional study of a large number of young persons seeking mental health care;
- Findings in the 12 to 17 year old age group are particularly novel;
- Key substance use measures were self-report only and not confirmed by interview;
- Participants were not asked about the amount of nicotine and cannabis use.

Introduction

Health prevention priorities in Australia include cessation of nicotine or cannabis use and reduction in alcohol-related harm[1-3]. Among those with mental illness, reductions in substance use-related harm and improved cardiovascular health are key clinical objectives. Epidemiological and longitudinal studies indicate that early substance misuse increases the risk of developing a mental illness and, conversely, early onset mental disorders are associated with increased risk of alcohol or other substance misuse[4-6].

Neurobiological studies increasingly demonstrate the adverse effects of alcohol or cannabis on brain development in teenagers and young adults[7]. Young people with mental disorders are at increased risk of later cardiovascular disease[8]. One of the most significant modifiable risk factors in this population appears to be cigarette smoking.

Within the new primary-care based mental health initiative, *headspace*: the national youth mental health foundation, a strong policy emphasis is placed on active management of alcohol or other substance-misuse problems. While it is clear that these new centres have the capacity to engage young people, the extent to which concurrent alcohol, nicotine or other substance misuse is being actively managed is yet to be identified.

From a physical health perspective, there is an urgent need to establish an early intervention agenda for these individuals who are at high risk of premature death or physical health morbidity from a range of medical conditions. Of particular note are the high rates of premature death due to cardiovascular disease in persons with depression and the prevalence of metabolic syndrome in those receiving treatments for major mood disorders. Additionally, the high rate of nicotine and cannabis use in young people with major mental health disorders puts them at risk of other smoking-related conditions.

From a mental health perspective, there is a need to better understand the early stages of substance misuse in young people with emerging mental disorders. The identification of substance use onset and subsequent patterns of use in such young people would help early intervention approaches. In this study, we determined the rates of alcohol, nicotine or cannabis use in young persons entering mental health care. Additionally, we sought to assess the patterns of comorbidity with specific mental disorders.

Methods

Participants aged 16 years or older provided their own written informed consent and parental/guardian consent was obtained for those under 16 years. The University of Sydney Human Research Ethics Committee approved the study.

Sample: Participants were recruited from two *headspace*[9] sites: (i) the Brain & Mind Research Institute, Camperdown; and (ii) Campbelltown (outer suburban, south-western Sydney). These services specialise in the assessment and early intervention of mental health problems in young people[10, 11]. Subjects in this study were included if they were: (i) accessing services at one of the above-mentioned *headspace* sites; (ii) between the ages of 12 and 30 years; (iii) and consented to be enrolled on a patient register. Participants were excluded if they did not have sufficient English-language skills. Thus, this study utilised data obtained from 2,122 young people (12 to 30 years) who consecutively volunteered to enter the patient register between October 2007 and June 2012. A subset of 522 participants also took part in specialised neurobiological research related to clinical outcomes. Hereafter, the entire sample (N=2,112) is referred to as the 'Youth Mental Health' (YMH) cohort. Referring clinicians were asked to determine primary and secondary diagnoses based on DSM-IV criteria. For the purposes of categorisation, clinicians were asked to select one of the following 'primary diagnosis' disorders: (i) 'depression'; (ii) 'bipolar'; (iii) 'anxiety' (including obsessive compulsive, generalised anxiety, agoraphobia/panic and social anxiety disorders); (iv)

'psychosis' (including first episode and schizophrenia); (v) 'behavioural/developmental' (including attention-deficit hyperactivity, conduct, oppositional defiance and impulse control disorders); (vi) 'substance use'; (vii) 'personality'; (viii) 'eating disorder'; (ix) 'autism spectrum'; (x) 'other'; and (xi) 'unclear, still assessing'.

Assessment: Clinical information was obtained via: (i) brief self-report questionnaire; and (ii) clinical assessment (detailed methods have been described previously[10, 11]).

Self-report: The questionnaire comprised basic demographic data as well as standardised questionnaires to measure common symptoms, psychosocial functioning, disability and vocational status upon entry to the service (findings reported previously[10, 11]). Participants were asked about their lifetime and current substance use using the first two items of the World Health Organization's 'alcohol, smoking and substance involvement screening test' (WHO-ASSIST)[12]. In item 1, participants were asked whether they ever used: (a) tobacco (nicotine) products; (b) alcoholic beverages; or, (c) cannabis. Subsequently, item 2 asked whether their use of each substance in the *past 3 months* was: (a) 'never'; (b) 'once or twice'; (c) 'monthly'; (d) 'weekly'; (e) 'daily or almost daily'.

Data Reduction: As a means to compare recent alcohol, nicotine or cannabis use in the YMH cohort with that of the general population the WHO-ASSIST item 2 data were re-categorised to align with the age bands and use categories of the 2010 National Drug Strategy Household Survey (NDSHS)[13]. Thus, responses were re-categorised as: (i) 'daily or almost daily'; (ii) 'weekly'; (iii) 'less than weekly' or (iv) 'never'. That is, responses of 'once or twice' and 'monthly' were collapsed to form the 'less than weekly' category. Furthermore, the YMH cohort was stratified into three age groups: (i) 12 to 17 years; (ii) 18 to 19 years; and (iii) 20 to 30 years.

Clinical assessment: Undertaken by psychiatrists, psychologists, mental health nurses or general practitioners with training in mental health. The assessing clinician verified key aspects such as

primary and secondary diagnoses/comorbidities, vocational status, medical comorbidity and general functioning via the social and occupational function assessment scale (SOFAS)[14].

Detailed assessment of alcohol use: For the sub-sample (N=522) only, the Alcohol Use Disorders Identification Test (AUDIT) was used to assess each participant's level of risky drinking in the past year, as well as their lifetime familiarity[15, 16]. Total scores range of from 0-40, with a higher score indicating more problematic drinking. A total score of 1 to 7 is indicative of low risk drinking; total scores 8-15 indicate 'risky drinking' with a moderate risk of harm; 16-19 indicating a high-risk or 'harmful' level of alcohol consumption, and 20-40 indicates a 'high-risk' level.

Statistical Analyses: Statistics were performed using SPSS for Windows 20.0. Group differences in demographic and clinical variables were assessed via analysis of variance (ANOVA) or chi-square tests. To determine whether age was a contributing factor to any observed differences in the prevalences of recent substance use, logistic regressions were conducted with a dichotomous dependent variable of substance use (e.g. 'at least weekly' versus 'less than weekly') and with diagnosis and age (and their interaction) entered as predictor variables. The forced entry method was employed and significant regression models were only accepted if the Hosmer-Lemeshow goodness-of-fit statistic was non-significant.

Results

Lifetime use

Among males, three quarters (75.9%; 506/667) of respondents (12 to 30 yrs) reported a lifetime use of alcohol, 63.3% (401/633) a lifetime use of nicotine and more than half (57.9%; 390/673) a lifetime use of cannabis. Similarly, for females, the lifetime rates were 75.6% (573/758), 60.3% (290/440) and 51.3% (391/762), respectively.

Age of first use

For males, the self-reported 'age of first use' for each substance was as follows: (i) alcohol = 14.6 ± 2.4 yrs (N=456); (ii) nicotine = 14.0 ± 2.6 yrs (N=385); and (iii) cannabis = 14.8 ± 2.9 yrs (N=127). For females, the age of first use for each substance was: (i) alcohol = 14.6 ± 2.3 yrs (N=531); (ii) nicotine = 14.2 ± 2.4 yrs (N=414); and (iii) cannabis = 15.6 ± 3.0 yrs (N=126). The age of first use of cannabis was significantly earlier in males [$F(1, 252)=5.7$, $p<.05$].

Recent use

The prevalence of each category of alcohol use increased with age (see Table 1a). The prevalence of daily and weekly drinking in the youngest (12-17 yrs) group was notable (almost 13%). In terms of sex differences, the most substantial differences were the increased rates of daily alcohol use in males in the 18-19 yrs and 20-29 yrs age groups (9.3% vs. 3.6% and 15.4% vs. 8.4%, respectively).

Almost one quarter (23.1%) of the younger group (12-17 yrs) used nicotine daily (see Table 1b). For the older groups the rates were 36 and 41%, respectively. While there were no substantial differences between younger (12-17 yr old) females and males in recent nicotine use, in the older groups, the proportion of daily nicotine use was higher in males (40.9% vs. 32.0% for 18-19 yrs; 48.0% vs. 34.6% for 20-30 yrs).

Notably, for the two younger groups (12-17 yrs and 18-19 yrs), the prevalence of daily cannabis use (see Table 1c) was higher than that for daily alcohol use (3.6% vs. 1.5% and 8.8% vs. 6.0%). Almost 20% of the 12-17 yrs group used cannabis at least once in past 3 months compared to more than 30% of the two older groups (33.1% and 36.0%, respectively). As with alcohol and nicotine, the males in two the older age groups were more likely to report using cannabis daily.

In terms of combined substance use, across the entire sample, 17.8% (367/2063) of cases reported 'at least weekly' use of both alcohol and tobacco; this combination was more common in males (at 20.5%; 196/954) as compared to females (15.4%; 171/1109). Similarly, the 'at least weekly' use of: (i) alcohol and cannabis; and (ii) nicotine and cannabis was higher in males (8.5% and 12.9%, respectively) compared to females (5.7% and 8.8%, respectively). Notably, the combination of all three substances used 'at least weekly' was at 5.4% in females (59/1096) and at 7.9% in males (75/945).

The relationships between substance and primary diagnostic categories are shown in Tables 2a, 2b and 2c. Due to some limitations (e.g. unequal sample sizes) and to facilitate interpretation, ANOVA and regression analyses included only the first five diagnostic categories (i.e. depression, bipolar, anxiety, psychosis and behavioural/developmental). Across the five diagnostic groups, there were significant main effects of age for the 'at least weekly' alcohol drinkers in both females [$F(4,229)=7.9$, $p<.001$] and males [$F(4,221)=5.9$, $p<.001$]; the behavioural/developmental group was the youngest in both. Despite sex, those with a primary diagnosis of a bipolar spectrum disorder were the most likely to report at least weekly use of alcohol (at 39.4%). Compared to females, within the depression and psychosis groups, young males reported more frequent use of alcohol.

There were significant main effects of age across the five diagnostic groups for both female [$F(4,297)=10.0$, $p<.001$] and male [$F(4,297)=14.7$, $p<.001$] 'at least weekly' users of nicotine. Despite sex, the rate of 'at least weekly' use of nicotine was above 30% for four of the five main diagnostic categories, with psychosis having the highest rate at 48.7%. The greatest difference between the sexes in terms of rates of 'at least weekly' nicotine use was seen in the psychosis group (37.5% of females vs. 53.8% of males).

There were significant main effects of age across the five diagnostic groups for both female [F(4,76)=3.0, p<.001] and male [F(4,99)=5.9, p<.001] 'at least weekly' cannabis users. Across all of the diagnostic groups males were more likely to be weekly cannabis users. The group with the highest prevalence of weekly cannabis use was males with 'psychosis', at 17.5%.

Among the remaining six diagnostic groups (see Tables 2a, 2b and 2c) the 'substance use' group, as expected, showed the highest levels of 'at least weekly' use of alcohol, nicotine and cannabis. Of note, over 63% of males with a personality disorder reported at least weekly nicotine use, compared to 46% of females. Interestingly, those with 'unclear' diagnoses showed moderately high prevalences of 'at least weekly' use across all three substances.

Logistic Regression Models

In females, for nicotine, the significant model [χ^2 (9)=40.9, p<.001] included only age as a significant predictor (p<.01). Similarly, for cannabis, the model [χ^2 (9)=21.7, p=.01] only included age (p<.05). In both models, as indicated by the beta coefficients for age (0.334 and 0.308, respectively), 'at least weekly' users were older. The regression model for current alcohol use in females was not acceptable (at p<.01). In males, for nicotine, the highly significant model [χ2 (9)=83.8, p<.001] included age (p<.001), diagnosis (p<.01) and age-by-diagnosis (p<.01) as predictors. For cannabis the model [χ2 (13)=59.5, p<.001] only included age (p<.01). As seen in females, the beta coefficients for age were positive in both models (0.265 and 0.162, respectively) indicating that 'at least weekly' users were older and, in the case of tobacco, more likely to be of a particular diagnosis (i.e. psychosis; see Table 2b). The regression model for current alcohol use in males was not acceptable (at p<.01).

Detailed alcohol use

Table 3 displays the demographics and social-occupational functioning of the subset (N=522) sample. As predicted, abstainers (N=159) were the youngest group; ANOVA comparing age across the five drinking categories was highly significant [$F(4,521)=27.1$, $p<.001$]. Scheffe's post-hoc tests confirmed that only the abstainers group significantly ($p<.001$) differed (in age) from any other group. After omitting the abstainers, there were no significant differences across the four drinking categories in terms of distribution of gender or age, however there was a difference in age of psychiatric onset [$F(3,289)=3.2$, $p<.05$].

Table 4 displays the proportions of individuals across the alcohol use categories by each primary diagnosis group. As above, ANOVA and regression analyses only included the first five diagnostic groups (see Table 4). As observed in the larger sample, the five groups were found to differ in mean age [$F(4,493)=25.4$, $p<.001$]. In terms of 'risky' drinking (i.e. hazardous or harmful or high-risk) the five diagnostic groups differed with the bipolar group having the largest proportion (46.7%) and the behavioural/developmental group having the lowest proportions of 'risky' drinkers (25.1%). A logistic regression with the dependent variable being 'no or low-risk' drinking (i.e. abstainers and low-risk) versus 'risky' (the remaining three categories) was found to show acceptable goodness-of-fit and a significant model [$\chi^2(9)=27.0$, $p<.001$] however there were no significant predictors (age, diagnosis, age by diagnosis).

Discussion

Despite adolescence being the peak period for the onset of both mental and substance misuse disorders, primary care based studies indicate these problems are not being effectively managed in young people. National community-based surveys have indicated the extent to which young people do not access care for either mental disorders or alcohol/substance misuse, and this lack of care is most evident for young men and for those with alcohol/substance misuse[17].

This is the first study to examine substance use patterns in a large sample (2000+) of young people accessing *headspace* services (albeit across two sites within the metropolitan of Sydney). The data presented here demonstrates that among young people who present for mental health care within the *headspace* network, alcohol, nicotine or cannabis uses are common. Given the comorbidity with significant mental health problems, these patterns of substance use are likely to contribute to increased risk of poor physical and/or mental health outcomes. Future studies will help to determine the representativeness of these data by evaluating other samples (currently there are more than 40 *headspace* sites nationally).

Compared to their age-matched peers in the general population (i.e. based on the findings of the 2010 NDSHS[13]) the patients in this study showed some differences in the rates of current substance use. Of note, our youngest group (12-17 yrs) was twice as likely to report weekly alcohol use compared to 12-17 year olds in the general population (i.e. 10.3% vs. 5.1%; see table 4.3 in[13]). These comparisons should be treated somewhat cautiously as the NDSHS[13] determined frequency of use over the past 12 months whereas our study assessed the past 3 months; furthermore, the NDSHS evaluated 'daily' use whereas we asked about 'daily or almost daily' use. Noting such limitations, 'daily' alcohol use in our YMH samples was at least three times greater than that observed in the general population (i.e. across the age groups;[13]). Similarly, 'daily' nicotine use in our YMH samples is at least twice as high as the general population estimates (again across the three age groups; see table 3.3 in[13]). With regards to 'any' recent cannabis use, our older YMH samples (i.e. 18-19 yrs and 20-30 yrs) were 1.5 times more likely to report recent cannabis use compared to their peers in the general population (see table 6.4 in[13]).

In this study, the relationships between recent substance use and diagnosis were complex, and were mainly affected by both age and gender. The logistic regressions models for nicotine or cannabis use were acceptable and in three of these models, only age was a significant predictor of weekly use; the exception being nicotine use in males where age and diagnosis both contributed. The

difference in the prevalences of weekly nicotine use among males with an anxiety disorder as compared to males with a psychotic disorder is notable. In general, weekly substance use appeared to be more likely if an individual was an older male and diagnosed with psychosis or bipolar disorder.

Information regarding the prevalence of frequent substance use among younger people seeking mental health care is limited. There is a general consensus that substance misuse in individuals with a mental disorder is common[6, 18, 19], particularly in treatment seeking populations; with evidence to suggest that 'problematic substance use is the most common comorbid condition among people with a major mental illness and is associated with poorer patient outcomes'[20]. In a large cross-sectional study of over 45,000 Australians attending primary care, 12% of respondents were identified as having any mental disorder with concurrent substance misuse[18].

Previous research has tended to evaluate the comorbidity of mental- and substance use- disorder in broad adult samples (i.e. "18 and above"). Despite this, key associations we have observed in the current YMH cohort are consistent with those observed in the literature. For example, a study of over 40,000 adults in the US found that comorbid substance use and mood/anxiety disorders are among the most prevalent of psychiatric disorders[21]; and notably, that bipolar disorders were more strongly related to the substance use disorders than any other mood or anxiety disorder. Similarly, other population based studies have demonstrated stronger associations between psychosis and nicotine[22] or cannabis use[23].

Of considerable relevance to preventing later poor physical health, at least weekly nicotine use was highly prevalent in those with psychosis (almost 50%). In an Australian study[24] of 1,812 individuals with severe psychotic disorders, for those aged 18-24 years the rate of nicotine use was 70.6%. When adopting the same parameters, albeit over the past 3 months, the current study yields a rate of 62.6% among young people who are early in the course of their disorder.

The presence of an anxiety or mood disorder has been shown to be the largest determinant of treatment seeking in cannabis users, regardless of the level of use[22]. A recent study[25] utilising a cohort of Australian secondary school students, reported that by the time participants reached 29 years their daily cannabis use was significantly associated with an anxiety disorder. In the current study, frequent cannabis use was particularly common in females with an affective disorder, whereas for males other diagnoses (including psychosis and bipolar disorder) tended to be associated with increased rates of frequent use.

Amoung the subset of YMH patients (N=522) the prevalence of low-risk drinkers (34%) is the same as that predicted in the population[13]. However, the rates of risky (i.e. hazardous: 20%, harmful: 7% plus high-risk: 9%) YMH drinkers are substantially higher than in the general population (23%)[13]. Notably, other research[26, 27] has found that hazardous levels of alcohol use tends to peak in the 20-25 year age range suggesting that, if left untreated, there may be an escalation in problematic use in the risky drinking groups. With regards to risky drinking categories, key diagnostic groups (i.e. bipolar and psychosis) tended to have the higher rates of risky drinkers.

This study is limited by several factors. Firstly, the key substance use measures were self-report only and not confirmed by interview. Furthermore, participants were not asked about the amount of nicotine and cannabis use only the recent (past three month) frequency of use. Follow-up longitudinal studies of these patients would be important to determine the long-term patterns of such substance use. Despite these limitations, this study shows that frequent use of alcohol, nicotine or cannabis use in young people seeking mental health care is common. Given restricted legal access, and in comparison to their peers in the general population, the patterns of use in the YMH patients aged 12-17 years are particularly notable. Reductions in use of these substances needs to be prioritised within services provided to these at-risk young people. Traditionally, mental health services have been separate to interventions that target substance use, however, there are growing

suggestions that complex young people (with comorbid mental health and substance use problems) would be most receptive to integrated rather than sequential or parallel approaches[28, 29].

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Table 1a: Recent (past 3 months) alcohol use in young (12 to 30 years) female (N=1116) and male (N=961) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
	Female		
Daily or almost daily	1.6% [9/553]	3.6% [7/196]	8.4% [31/367]
Weekly	11.2% [62/553]	33.7% [66/196]	31.3% [115/367]
Less than weekly	36.2% [200/553]	41.3% [81/196]	42.2% [155/367]
Never	51.0% [282/553]	21.4% [42/196]	18.0% [66/367]
	Males		
Daily or almost daily	1.4% [7/496]	9.3% [13/140]	15.4% [50/325]
Weekly	9.3% [46/496]	32.1% [45/140]	36.9% [120/325]
Less than weekly	32.7% [162/496]	43.6% [61/140]	35.4% [115/325]
Never	56.7% [281/496]	15.0% [21/140]	12.3% [40/325]

Note: Age-group categories were used to be consistent with 2010 National Drug Strategy Household Survey[13]

Table 1b: Recent (past 3 months) nicotine use in young (12 to 30 years) female (N=1119) and male (N=965) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
Females			
Daily or almost daily	23.0% [127/552]	32.0% [62/194]	34.6% [129/373]
Weekly	4.2% [23/552]	4.1% [8/194]	5.6% [21/373]
Less than weekly	12.9% [71/552]	17.0% [33/194]	12.9% [48/373]
Never	60.0% [331/552]	46.9% [91/194]	46.9% [175/373]
Males			
Daily or almost daily	23.1% [115/497]	40.9% [56/137]	48.0% [159/331]
Weekly	5.0% [25/497]	4.4% [6/137]	5.7% [19/331]
Less than weekly	9.7% [48/497]	5.8% [8/137]	10.6% [35/331]
Never	62.2% [309/497]	48.9% [67/137]	35.6% [118/331]

Table 1c: Recent (past 3 months) cannabis use in young (12 to 30 years) female (N=1096) and male (N=945) patients

	% [n/N]		
	12 to 17 yrs	18 to 19 yrs	20 to 30 yrs
Females			
Daily or almost daily	3.5% [19/540]	6.8% [13/190]	7.9% [29/366]
Weekly	2.2% [12/540]	3.7% [7/190]	6.3% [23/366]
Less than weekly	12.4% [67/540]	22.1% [42/190]	18.6% [68/366]
Never	81.9% [442/540]	67.4% [128/190]	67.2% [246/366]
Males			
Daily or almost daily	3.7% [18/486]	11.5% [16/139]	14.4% [46/320]
Weekly	4.1% [20/486]	7.9% [11/139]	8.4% [27/320]
Less than weekly	13.8% [67/486]	14.4% [20/139]	16.9% [54/320]
Never	78.4% [381/486]	66.2% [92/139]	60.3% [193/320]

Table 2a: Proportion of 'at least weekly' use of alcohol across each diagnostic category in N=2077 young (12 to 30 years) female and male patients

	Females [N=290/1116]		Males [N=281/961]	
	Age	% at least weekly	Age	% at least weekly
Depression	20.3 ± 3.5	24.0% [115/480]	20.3 ± 3.2	31.2% [97/311]
Bipolar	21.8 ± 3.2	39.4% [43/109]	22.1 ± 2.6	39.2% [20/51]
Anxiety	19.1 ± 3.0	22.9% [50/218]	20.3 ± 2.3	20.1% [31/154]
Psychosis	20.6 ± 4.1	20.8% [10/48]	22.0 ± 3.8	40.8% [42/103]
Beh/Dev	16.3 ± 2.4	17.4% [12/69]	18.7 ± 3.6	20.0% [32/160]
Substance Use	19.8 ± 3.1	92.3% [12/13]	19.1 ± 2.8	63.0% [17/27]
Personality	19.0 ± 3.1	37.5% [9/24]	17.2 ± 1.5	36.4% [4/11]
Eating Disorder	19.6 ± 2.3	27.8% [5/18]	19.5 ± 0.7	40.0% [2/5]
Autistic Spectrum	19.0	25.0% [1/4]	19.0	5.5% [1/18]
Other	17.9 ± 2.9	21.6% [11/51]	21.1 ± 2.8	28.3% [15/53]
Unclear	18.7 ± 2.6	26.8% [22/82]	19.9 ± 3.3	29.4% [20/68]

Note: "Beh/Dev" = behavioural/developmental

Table 2b: Proportion of 'at least weekly' use of nicotine across each diagnostic category in N=2084 young (12 to 30 years) female and male patients

	Females [N=370/1119]		Males [N=380/965]	
	Age	% at least weekly	Age	% at least weekly
Depression	18.9 ± 3.1	30.5% [147/482]	19.2 ± 3.6	39.2% [122/311]
Bipolar	20.7 ± 3.2	44.5% [49/110]	20.6 ± 3.6	40.4% [21/52]
Anxiety	18.3 ± 3.1	24.9% [54/217]	19.6 ± 3.0	24.8% [38/153]
Psychosis	21.3 ± 4.6	37.5% [18/48]	21.7 ± 3.5	53.8% [56/104]
Beh/Dev	16.7 ± 3.2	43.5% [30/69]	17.0 ± 3.2	39.9% [65/163]
Substance Use	19.8 ± 3.2	84.6% [11/13]	19.3 ± 2.8	70.4% [19/27]
Personality	18.1 ± 3.1	45.8% [11/24]	18.4 ± 3.2	63.6% [7/11]
Eating Disorder	20.0 ± 1.7	17.6% [3/17]	19.5 ± 0.7	40.0% [2/5]
Autistic Spectrum	na	na	15.7 ± 3.0	16.7% [3/18]
Other	18.6 ± 3.3	26.9% [14/52]	19.9 ± 3.5	30.8% [16/52]
Unclear	17.5 ± 2.7	39.8% [33/83]	18.6 ± 3.5	44.9% [31/69]

Note: "Beh/Dev" = behavioural/developmental

Table 2c: Proportion of 'at least weekly' use of cannabis across each diagnostic category in N=2041 young (12 to 30 years) female and male patients

	Females [N=103/1096]		Males [N=138/945]	
	Age	% at least weekly	Age	% at least weekly
Depression	19.7 ± 3.0	8.5% [40/471]	20.2 ± 3.4	14.3% [44/307]
Bipolar	22.3 ± 3.4	11.9% [13/109]	20.9 ± 2.6	15.4% [8/52]
Anxiety	18.6 ± 3.2	6.6% [14/211]	21.0 ± 2.5	7.3% [11/150]
Psychosis	21.0 ± 3.6	6.1% [3/49]	22.1 ± 3.9	17.5% [18/103]
Beh/Dev	18.4 ± 3.1	10.4% [7/67]	17.3 ± 2.4	12.1% [19/157]
Substance Use	19.0 ± 2.9	61.5% [8/13]	18.7 ± 2.0	56.0% [14/25]
Personality	19.2 ± 3.7	16.7% [4/24]	21.5 ± 4.9	18.2% [2/11]
Eating Disorder	20.0 ± 1.7	17.6% [3/17]	na	na
Autistic Spectrum	na	na	16.0 ± 4.2	11.1% [2/18]
Other	20.0 ± 1.7	5.9% [3/51]	19.7 ± 3.7	11.5% [6/52]
Unclear	18.1 ± 2.2	10.0% [8/80]	18.9 ± 3.4	21.5% [14/65]

Note: "Beh/Dev" = behavioural/developmental

Table 3: Demographics and level of functioning according to AUDIT drinking category in N = 522 young (12 to 30 years) patients

	Abstainers [N=159]	Low-risk [N=177]	Hazardous [N=104]	Harmful [N=36]	High-risk [N=46]
% females	46.5	53.7	54.8	47.2	39.1
Age	17.1 ± 4.1	21.1 ± 4.2	20.7 ± 3.8	21.6 ± 3.6	20.8 ± 4.2
Age, psychiatric onset	13.6 ± 4.3	16.3 ± 4.3	15.7 ± 3.9	16.3 ± 5.2	13.8 ± 3.5
SOFAS	58.9 ± 11.1	59.9 ± 11.9	62.7 ± 11.9	62.4 ± 12.2	57.6 ± 11.0

Note: AUDIT = alcohol use disorder identification test

Table 4: Prevalence of AUDIT drinking categories within each psychiatric syndrome for N = 522 young (12 to 30 years) patients

	Age	% females	Abstainers [N=159]	Low-risk [N=177]	Hazardous [N=104]	Harmful [N=36]	High-risk [N=46]
Depression [N=192]	19.0 ± 4.1	62.0	29.7% (57)	33.9% (65)	21.4% (41)	6.2% (12)	8.9% (17)
Bipolar [N=105]	21.1 ± 3.7	68.6	15.2% (16)	38.1% (40)	26.7% (28)	8.6% (9)	11.4% (12)
Anxiety [N=45]	18.2 ± 4.3	42.2	44.4% (20)	26.7% (12)	15.6% (7)	8.9% (4)	4.4% (2)
Psychosis [N=108]	22.5 ± 4.0	28.7	31.5% (34)	36.1% (39)	18.5% (20)	7.4% (8)	6.5% (7)
Beh/Dev [N=44]	16.7 ± 4.1	25.0	47.7% (21)	27.3% (12)	11.4% (5)	2.3% (1)	11.4% (5)
Subst. Use [N=1]	26.0	0.0	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (1)	0.0% (0)
Autistic Spect. [N=5]	15.8 ± 2.3	0.0	60.0% (3)	20.0% (1)	0.0% (0)	0.0% (0)	20.0% (1)
Other [N=16]	18.4 ± 4.1	43.8	31.2% (5)	37.5% (6)	12.5% (2)	6.2% (2)	12.5% (2)
Unclear [N=6]	16.8 ± 4.0	33.3	50.0% (3)	33.3% (2)	16.7% (1)	0.0% (0)	0.0% (0)

Note: AUDIT = alcohol use disorder identification test; “Beh/Dev” = behavioural/developmental

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Competing interests statement

Dr Daniel Hermens is currently supported by a grant from the NSW Ministry of Health, Mental Health and Drug & Alcohol Office as well as an NHMRC Australia Fellowship (awarded to Professor Hickie). In 2007, he received honoraria for educational seminars from Janssen-Cilag.

Dr Elizabeth Scott is the (unpaid) Clinical Director of Headspace Services at the BMRI, the (unpaid) Co-ordinator of the Youth Mental Health Research Program at the BMRI, and Deputy Director of St Vincent's Private Hospital Young Adult Mental Health Unit. She has received honoraria for educational seminars related to the clinical management of depressive disorders supported by Servier and Eli-Lilly pharmaceuticals. She has participated in a national advisory board for the antidepressant compound Pristiq, manufactured by Pfizer.

Professor Hickie is a member of the Medical Advisory Panel for BUPA Health Insurance (Australia) and also a Board Member of Psychosis Australia Trust. From 2012, he is a Commissioner in Australia's new National Mental Health Commission. He was until January 2012 a director of headspace: the national youth mental health foundation. Prof Hickie was previously chief executive officer (till 2003) and clinical adviser (till 2006) of beyondblue, an Australian National Depression Initiative. He is supported principally for clinical research in depression and health services and population health initiatives related to anxiety and depression by a NHMRC Australian Medical Research Fellowship (2007-12). He has led projects for health professionals and the community supported by governmental, community agency and pharmaceutical industry partners (Wyeth, Eli Lily, Servier, Pfizer, AstraZeneca) for the identification and management of depression and anxiety. He

has received honoraria for presentations of his own work at educational seminars supported by a number of non-government organisations and the pharmaceutical industry (including Pfizer, Servier and Astra Zeneca). He has served on advisory boards convened by the pharmaceutical industry in relation to specific antidepressants, including nefazodone, duloxetine, and desvenlafaxine. He leads a new investigator-initiated study of the effects of agomelatine on circadian parameters (supported in part by Servier but also by other NHMRC funding) and has participated in a multicentre clinical trial of agomelatine effects on sleep architecture in depression and a Servier-supported study of major depression and sleep disturbance in primary care settings. In addition to national and international Government-based grant bodies, investigator-initiated mental health research at the BMRI he has been supported by various pharmaceutical manufacturers (including Servier and Pfizer) and not-for-profit entities (including the Heart Foundation, beyondblue and the BUPA Foundation).

Author contributions

DFH, EMS, SLN & IBH designed the study and wrote the protocol. DFH and ML reviewed the literature; DH, DW & ML conducted the statistical analyses. DFH, ML, DW & IBH drafted the manuscript. DH, DW, BW and SN were involved in study coordination, administration of neuropsychological and data analyses. JL & BW contributed to the study interpretation and drafts of the manuscript. All authors contributed to and have approved the final manuscript.