A study of the patterns and correlates of substance use among adolescents applying for drug treatment

Abstract

Objective: To inform planners by providing a psychosocial and drug-use profile of adolescents who have applied for a drug-treatment program.

Method: The setting was a residential drug-treatment program in Sydney for adolescents from NSW and the ACT. The design was a descriptive study of consecutive program applicants over 18 months. Study participants were 14-18 years, 53% were male. Most assessments were telephone interviews. The instrument incorporated the Opiate Treatment Index, Adolescent Drug Abuse Diagnosis, Severity of Dependence Scale and Symptom Checklist 90-Revised (SCL-90-R).

Results: Study participants tended to be poly-substance users, mostly using cannabis, heroin and/or alcohol. Heavy use in terms of frequency and amounts of use were reported, e.g. 50% of the sample used heroin daily and the mean number of standard drinks consumed on the last day of drinking was 18. High levels of problems in the areas of social functioning, criminal activity, psychological distress, physical health, HIV risk and substance dependence were reported. For example, most participants were unemployed and 88% had committed a crime in the previous month. Higher rates of some problems were identified among females, heroin users and benzodiazepine users.

Conclusions: The sample reported a high level of involvement in substance use and associated problems. The profile suggested that improvements might be difficult to achieve and to maintain.

Implications: A comprehensive, intensive, longer-term drug-treatment program to address the number and extent of substance-related problems for such adolescents is recommended.

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There has been growing concern about the need to provide appropriate services for adolescents with problems relating to substance use or dependence, in particular a psychoactive substance use disorder (PSUD) as defined in the Diagnostic and Statistical Manual of Mental Disorders IV.[1] Information about this client group is necessary for both service planning and service provision.

From a planning point of view, information about the extent and severity of problems among the client group indicates the type and level of service required. While there has been some debate about the issue of treatment matching for PSUDs,[2] it is likely that the intensity and duration of treatment needs to increase as problem severity increases.[3-5] Relative to information about adults in PSUD-treatment interventions, information on the nature of substance use and associated problems among adolescents seeking treatment for a PSUD is scarce; comparisons with adults in treatment or adolescents in the general population are even rarer. Without such comparisons it is difficult to interpret a group's pattern of behaviours and health symptoms. In particular, given the higher cost of intensive, residential treatment interventions relative to non-residential programs,[6] does the profile of adolescents applying for a residential PSUD-treatment intervention suggest that such a program is warranted?

It could be hypothesised that, as adolescents seeking treatment for a PSUD have not used substances for as long as adults in such treatment, the severity of the adolescents' problems would be less and their treatment needs would be less. Studies of adolescents compared with adults in residential communities in the United States have been reviewed elsewhere.[7] Jainchill and colleagues reported that, relative to adults in therapeutic communities, adolescents were more likely to have been referred by the criminal justice system, to have lower motivation for treatment, and to have problems with alcohol or cannabis use rather than heroin use. Adolescents have also reported levels and patterns of psychological disturbance that were similar to those of adults in therapeutic communities. For example, mild to moderate levels of depression, anxiety and poor self-esteem were evident, and females were more psychologically disturbed than males. It appears that the type of substances used and the route of entry to treatment differ. Referrals from the justice system are more prevalent and psychological dysfunction is equivalent for adolescents and adults in therapeutic communities in the US.

Service providers require information

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about the nature of the client group's problems to inform program planning. Reviews of the risk factors, correlates and consequences of substance abuse among adolescents have identified that adolescents presenting for treatment are likely to have high rates of the following characteristics: a lack of social bonding; feelings of alienation; a history of low-quality and consistency of family management, family communication, family relationships and parental role-modelling; a history of traumatic experiences, such as abuse or neglect; significant emotional or psychiatric problems; inadequate coping skills and social supports; inadequate social skills; a history of associating with substance-using peers; a history of low commitment to education, failure at school and unemployment; a history of anti-social behaviour and delinquency; poor physical health; and high risk of exposure to transmissible diseases.[8,9] The conclusions from these reviews were that PSUD-treatment interventions need to be multimodal, to address as many of the risk factors, correlates and consequences of substance abuse as possible.

Some of the correlates of substance abuse have also been related to treatment outcome. Client-related variables that have been found to be predictive of poorer treatment outcomes include criminal involvement, unemployment, more intense substance use, more severe psychiatric disorder or emotional problems, and a less-stable family background.[10-12]

Information on the pattern of substance use by clients is also relevant for service provision. There were indications of a decrease in alcohol abuse and an increase in heroin dependence among New South Wales (NSW) adolescents in PSUD-treatment during the 1990s.[13] This trend reflected an increase in heroin use among the broader population of young people in NSW over that period.[14,15] Given increasing concerns about heroin-related public health problems, such as overdoses[16-18] and disease transmission from unsafe injecting practices,[19-22] this increase in heroin use is an important issue. Benzodiazepine use among the client group is also of interest because of previous research by Ross and Darke suggesting that benzodiazepine use is associated with higher levels of problems.[23]

This paper presents data on the substance use patterns, HIV risk-taking behaviours, criminal behaviour, social functioning, physical health and psychological distress of adolescents who applied for an intensive, residential PSUD-treatment intervention. Questions addressed by the analyses were:

a) What was the pattern of substance use by the sample?
b) What is the extent of problems among the sample in terms of HIV risk-taking behaviours, criminal behaviour, social functioning, physical health, psychological distress?

To assist in interpretation of the results, the data were compared with data from studies using the same instruments with adults,[24-28] and with adolescents from the general population.[29,30]

Method

Participants

The study sample comprised all adolescents who applied for an intensive, residential PSUD-treatment intervention in Sydney and who were screened as suitable for the intervention between October 1996 and February 1998 (n=121). Screening was conducted over the telephone, using a short screening instrument that had been specially designed for the intervention. The screening form checked for the criteria of:

- being 14-18 years old;
- residing in NSW or the Australian Capital Territory (ACT);
- experiencing substance-use-related problems consistent with the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria for substance abuse or dependence;[1]
- being physically and mentally capable of participating in the intervention; and
- being able to speak English.

About half (53%) the adolescents in the sample were male and males (mean=16.4, SD=1.0) were significantly older than the females (mean=15.9, SD=1.3) (t=118, df=118, p=0.02). When asked which ethnic group they identified with, 61% stated, 'Australian'. The remainder identified with Aboriginal (11%), Indo-Chinese (8%), Pacific Islander or Maori (8%), East European (3%), Middle Eastern (3%) or other (5%) ethnic cultures. Not all study participants who identified as 'Australian' had Anglo-Saxon backgrounds or Australian-born parents.

The most common source of referral to the intervention was the juvenile justice system (38%), followed by specific PSUD-treatment or referral services (19%), family (14%), self (14%), health services (8%) and welfare agencies (7%). Most clients had involvement with more than one referral source.

Instruments

The research instrument included a modified form of the Opiate Treatment Index (OTI),[24] a modified frequency of substance use item from the Adolescent Drug Abuse Diagnosis (ADAD),[31] the Severity of Dependence Scale (SDS),[32] and the Symptom Checklist-90-Revised (SCL-90-R).[29] Each of the instruments were chosen because:

- they had demonstrated good psychometric properties,[27,29,33,34]
- pilot-testing indicated that they were easily understood by the study population; and
- they covered the main domains of interest to the study.

The OTI assesses substance use, HIV risk behaviours, social functioning, criminal behaviour and physical health. The SDS is a five-item scale that assesses substance dependence symptoms. It focuses on the amount of psychological dependence as indicated by concern about impaired control. The SDS has demonstrated high sensitivity and specificity for identifying substance dependence among a range of substance users.[23,27,35,36] The SCL-90-R is a psychiatric screening instrument that assesses psychological symptom status on nine dimensions: somatisation, obsessive-compulsive traits, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. The mean score across the dimensions of the SCL-90-R is the Global Severity Index (GSI). Items on the SCL-90-R were rated by the study participants from 0 (indicating no

distress) to 4 (indicating extreme distress). Further details on the instrument are presented elsewhere.[37]

Recruitment

Recruitment of study participants was embedded within the procedures for intake at the intervention. All applicants to the intervention who were screened as suitable for the intervention were sent an application pack and asked to telephone the intervention for a baseline assessment. During the data collection period, 266 people called to inquire about entry to the intervention, of whom 220 were screened as suitable for the intervention. Of the 220 screened as suitable, 122 proceeded with the application and did the assessment interview. Telephone inquiries made to those who did not proceed with the application indicated that most changed their minds about wanting treatment. Data was lost for one study participant, so the final sample size was 121.

Data collection

Nearly all the interviews were conducted by telephone. Face-to-face interviews were rare because, being a state-wide program, applicants usually lived one to 12 (or more) hours travel from the study centre. Study participants were sent a copy of the instrument form so that they could read the questions and multiple-choice answers during the interview. Responses were recorded by the interviewer. The interviewee was provided with sufficient information to give informed consent to participate in the study and confidentiality was stressed.

Data analysis

Data were entered into an SPSS database, verified, then analysed using SPSS for Windows. Descriptive statistics, including frequencies, means (*M*) and standard deviations (SD), were calculated. Some simple tests for group differences, between males and females, heroin users and non-heroin users, and benzodiazepine users and non-benzodiazepine users were conducted: chi-square (χ^2) for categorical data and *t*-test (*t*) for continuous data. When linear trends of two groups were compared, the Mantel-Haenzel χ^2 statistic for linear trend was used, with one degree of freedom (*df*). Multivariate logistic regression tested the associations between multiple independent variables and dichotomous dependent variables.[38] Multivariate logistic regression was performed with backward elimination of variables that had a Wald statistic that was not significant at the 0.1 significance level. Details of the models are described below. Odds ratios (OR) and their 95% confidence intervals (CI) are reported for significant variables from the models. Scoring of the OTI, the SCL-90-R and the SDS, described below, was based on procedures outlined by the authors of each instrument.[24,27,29]

Three models were tested by multivariate logistic regression:

1. Given the increasing use of heroin by young people, the first model tested for patterns of substance use among heroin users relative to other adolescents with a PSUD. The use of benzodiazepines, alcohol and cannabis (independent variables) were used to predict heroin use (dependent variable).

2&3. As mentioned above, previous research has identified increasing use of heroin by young people, and benzodiazepine use as a marker for problems. The second and third models aimed to identify whether heroin use or benzodiazepine use (dependent variables) were associated with a more severe profile of substance-related problems relative to non-use among the sample. Independent variables in these models were HIV risk-taking behaviour, social functioning, criminal behaviour, physical health and psychological distress (GSI). To adjust for the significant correlation between benzodiazepine use and heroin use (identified in model 1), benzodiazepine use was an independent variable when heroin use was a dependent variable, and vice versa. Given that there were significant intercorrelations between a number of the predictor variables, descriptive statistics and the results of univariate tests of significance are also presented.

The methods for calculating scores are described below:

Substance use

The OTI was used to calculate average daily quantities of use of each substance in the previous month, while the ADAD was used to summarise the frequency of use of each substance. Daily quantities were calculated by dividing the average daily amount of use on the last two days of use by the average number of days between occassions of use. For example, a person who used one unit of a substance once every day had a score of (1+1)/(1+1)=1 for that substance, while a person who used one unit of a substance once a week had a score of (1+1)/(7+7)=0.3 for that substance.

HIV Risk-Behaviour Scale (HRBS)

Scores on the drug use section of the HRBS were added to obtain the drug use subtotal: a score out of 30 for HIV risk due to unsafe injecting. Scores on the sexual behaviour section of the HIV risk section were added to obtain the sexual behaviour subtotal: a score out of 25 for HIV risk due to unsafe sex. The drug use subtotal and the sexual behaviour subtotal were added to obtain a score out of 55 for total HIV risk behaviour. Higher scores were indicative of more risk-taking behaviours.

Social functioning

Scores on the social functioning section were added to obtain a total score out of 48 for social functioning. Higher scores were indicative of poorer social functioning.

Criminal behaviour

Study participants reported levels of involvement (no involvement to daily involvement) in four types of crime: property crime, fraud, dealing illicit substances and violent crime. These scores were added to obtain a total crime scale score ranging from 0 for no criminal behaviour to 16 for daily involvement in all four crime types. Scores greater than 1 for each of the four crime types were used to identify any involvement in each of those types of crime.

Physical health

The numbers of physical health symptoms reported for each subsection (for example, general health, neurological health) were added to obtain physical health sub-total scores. the physical health scale score was calculated by adding each of the physical health sub-totals. The maximum possible score on the physical health scale was 47.

Substance dependence

Each of the five items of the severity of dependence scale (SDS) has a four-point scale from 0 to 3. The items were added to give a total score with a range of 0 to 15. The recommended cut-off score for identification of dependence has varied between studies from 4 for identifying heroin, cocaine and amphetamine dependence,[27,36] to 3 for cannabis[35] and benzodiazepine dependence.[23] The more conservative cut-off of 4 was used to indicate dependence among this sample. As the SDS was a late addition to the study, data was only available on the last 35 study participants recruited.

Psychological distress

Raw scores for each domain of the SCL-90-R were calculated by summing the items from each domain. The sample's mean raw scores on each domain of the SCL-90-R were converted to standard (normalised) area *t*-scores using norms from non-patient adolescents in the US. The *t*-scores were then used to calculate percentile ranks for the sample on each domain. For each domain, study participants whose scores were two standard deviations (SD) above the general population means were also identified. Caseness was calculated using the operational rule that if a study participant had a GSI *t*-score greater than 62 (using non-patient adolescent norms) or two dimension *t*-scores greater than 62, then that study participant was defined as a positive risk or 'case'.[29]

Results

Frequency of substance use

The substances most likely to have been used on a daily basis were tobacco, cannabis and heroin. Daily use of other substances, including alcohol, was not common (see Table 1).

Differences in frequency of use between males and females were tested. Categories included 'daily use', 'less than daily use' or 'no use in the previous month'. For substances used by less than 20% of the sample, 'any use' was compared with 'no use in the previous month'. There were no significant differences between males and females in the frequency of use of cannabis, heroin, alcohol, amphetamines or benzodiazepines, nor in the use of hallucinogens/designer drugs, cocaine, inhalants or methadone ($p>0.05$).

Table 1: Use of each substance in the past month (n=121).

Substance type	No use %	Non-daily use %	Daily use %	Total %
Tobacco	1	1	98	100
Cannabis	17	22	61	100
Heroin	35	15	50	100
Alcohol	37	51	12	100
Amphetamine	61	34	5	100
Benzodiazepines	62	31	7	100
Hallucinogens	78	22	0	100
Cocaine	88	7	5	100
Inhalants	88	10	2	100
Methadone	88	10	2	100
'Designer' drugs	88	12	0	100
Steroids	99	0	1	100

Number of substances used

The average number of substances used by the sample in the previous month was 4.5 (SD=1.6, range=2-9). There was no significant gender difference in the number of substances used (t=0.28, df=119, p=0.8).

Amount of substances used

Statistics on the amounts of use on the last days of use for cannabis (cones), alcohol (standard drinks) and benzodiazepines (pills) were calculated. The summary statistics for cannabis and alcohol were skewed by a small number of outliers. The methods for identifying and dealing with outliers suggested by Tabachnick and Fidell were used.[38] Outliers were defined as values greater than 3.29 standard deviations above the mean. Outlying cases were assigned new scores on the 'offending' variables that were one unit larger than the next most extreme score on the distribution. The summary statistics for amount of substances used after making these transformations for alcohol and cannabis use are presented in Table 2. T-tests for independent means identified no significant difference in the amount of use of alcohol, cannabis

Table 2: Amount of substance used on the last day of use – outliers adjusted.

Substance type	n	Unit	Mean	SD	Range	Outliers[a]
Alcohol	76	Standard drinks	18	11	1-43	75, 92
Cannabis	101	Cones	16	17	1-73	84, 85, 100
Benzodiazepines	46	Pills	9	9	1-36	None

Note:
(a) Values greater than 3.29 standard deviations above the mean were defined as outliers. To reduce their influence on summary statistics, outliers were recoded to 1 unit more than the next most extreme score.

nor benzodiazepines by gender after the outliers were adjusted ($p>0.05$).

Patterns of substance use

Multivariate logistic regression identified that heroin use was positively associated with benzodiazepine use ($\chi^2=3.9$, $df=1$, $p=0.049$, OR=1.79, 95% CI 1.33-2.40), negatively associated with alcohol use ($\chi^2=16.3$, $df=1$, $p=0.0001$, OR=0.89, 95% CI 0.87-0.92) and not significantly associated with cannabis use ($\chi^2=0.13$, $df=1$, $p=0.7$). With or without cannabis use in the model, the substance use model accurately predicted 74% of cases, i.e. the sample appeared to be split between adolescents who used heroin and adolescents who drank alcohol, and both groups were equally likely to use cannabis. Benzodiazepines were primarily used by heroin users.

Substance dependence

For the 35 study participants who answered the SDS questions, the mean score was 9.3 (SD=2.9, range 4-14). There was no significant difference between males and females in SDS scores ($t=0.38$, $df=33$, $p=0.7$). Only one of the 35 study participants had a score below 5, with a score of 4. Therefore, using the criteria described previously, all the participants were likely to be substance dependent.

HIV risk-taking behaviour

Half the sample (53%, n=64) had injected a substance in the previous month and were administered the drug use section of the HRBS. Males and females were equally likely to have injected in the previous month ($\chi^2=1.1$, $df=1$, $p=0.3$). Drug-use risk behaviour subtotal scores ranged from 1 to 21 ($M=7.5$, SD=4.0). Female injectors ($M=8.6$, SD=4.3) had a significantly higher score on the drug use risk behaviour subtotal than males ($M=6.4$, SD=3.4) ($t=2.2$, $df=62$, $p=0.03$). Among the injectors, 14% reported that they had used a needle after somebody else in the previous month and 31% reported that somebody had used a needle after them. Injecting 'risk' was mainly associated with not using bleach to clean a needle after reusing it: 74% of injectors who reused rarely or never cleaned with bleach. Most of these injectors were reusing their own needles, so they felt that bleach was not necessary.

Significantly more females (86%) than males (63%) ($\chi^2=8.5$, $df=1$, $p=0.004$) had engaged in sexual behaviour in the previous month. Those who had been sexually active were administered the sexual behaviour section of HRBS (n=89). Scores for the sexual behaviour risk subtotal ranged from 0 to 15 ($M=5.5$, SD=2.9) and were significantly higher among females ($M=6.1$, SD=3.0) than males ($M=4.6$, SD=2.5) ($t=2.6$, $df=86$, $p=0.01$). Not using a condom during paid sex (1%) and engaging in anal sex (3%) were rarely reported. Among those who had sex with a casual partner (n=35), 54% did not use a condom every time they did so.

The mean score on the total HIV Risk Behaviour Scale (HRBS) for the whole sample (n=121) was 8.0 (SD=6.5, range:0-27, mode=0). Females ($M=10.3$, SD=6.6) had a significantly higher HRBS score than males ($M=6.0$, SD=5.6) ($t=3.8$, $df=118$, $p<0.0001$).

Social functioning

Of a possible total of 48, where high scores indicated poorer social functioning, the sample mean on the OTI social functioning scale was 22.2 (SD=5.5, range 10-34). Study participants' scores for individual items on the social functioning scale indicated poor functioning in terms of employment (76% unemployed for most or all of the previous three months), conflict with the family (64% had conflict with their family often or very often in the previous three months) and association with substance-using peers (66% of the sample reported that most or all of their friends were substance users). It appeared that friends played a major role in the lives of the sample: 84% saw their friends often or very often, 78% of the sample reported that they seldom had conflict with their friends, and 59% reported that they were satisfied or very satisfied with the support they received from their friends.

Females ($M=23.7$, SD=5.7) had a significantly higher mean

Table 3: SCL-90-R dimension scores by gender (n=120, missing=1).

SCL-90-R dimension	Gender				*p*
	Female		Male		
	M	SD	M	SD	
Somatisation	1.08	0.86	0.72	0.65	0.01
Obsessive-compulsive	1.54	0.92	1.14	0.77	0.01
Interpersonal sensitivity	1.23	0.93	0.74	0.66	0.001
Depression	1.73	0.96	1.16	0.55	0.001
Anxiety	1.19	0.91	0.8	0.67	0.009
Hostility	1.77	1.10	1.2	0.97	0.003
Phobic anxiety	0.72	0.78	0.3	0.49	<0.0001
Paranoid ideation	1.42	0.86	0.97	0.81	0.004
Psychoticism	1.28	0.86	0.57	0.45	<0.0001
Global severity index	1.35	0.77	0.89	0.56	<0.0001

Note:
*Means (*M*), standard deviations (*SD*) and significance of gender differences (p).*

Table 4: Percentage of study participants 2 *SD* above SCL-90-R domain means by gender (n=121).

Domain	Gender		*p*
	Female (%)	Male (%)	
Hostility	32	14	0.02
Depression	26	6	0.002
Obsessive-compulsive	21	8	0.04
Somatisation	21	8	0.04
Anxiety	20	6	0.03
Phobic anxiety	19	5	0.01
Psychoticism	19	0	0.001
Paranoid ideation	12	9	0.6
Interpersonal sensitivity	7	2	0.1
Global Severity Index (GSI)	40	14	0.001

score on the social functioning scale than males (M=20.1, SD=5.3) (t=2.8, df=118, p=0.006). This gender difference was accounted for by higher rates of residential mobility, conflict with a partner and living with people who use substances among females than males.

Criminal behaviour

Most of the clients (88%) reported some form of criminal behaviour in the month prior to the interview. Most were involved in property crime (74%). Less common were dealing (49%), crimes involving violence (42%) and fraud (21%). There were no significant differences between males and females in involvement in each of these crime categories (p>0.05). However, males (72%) were significantly more likely than females (50%) to be facing charges at the time of the assessment (χ^2=5.6, df=1, p=0.02). With a maximum possible score of 16 indicating daily involvement in all four types of crime, the mean score on the crime scale was 4.8 (SD=3.1, range 0-12). There was no gender difference in scores on the crime scale (t=0.6, df=116, p=0.5).

Physical health

Study participants reported a mean of 17 health symptoms on the OTI health scale (SD=8.7, range=2-38). The study participants were most symptomatic in general health – particularly poor appetite (74%), trouble sleeping (74%) and fatigue or energy loss (69%); followed by neurological health – particularly forgetting things (80%) and headaches (67%); cardio/respiratory health – particularly coughing up phlegm (65%); and gastro-intestinal health – such as stomach pains (65%).

Females reported significantly more physical health symptoms than males (t=2.7, df=119, p=0.007). In particular, females reported significantly more symptoms relating to general health, genito-urinary health, gastro-intestinal health and injecting than males (p<0.05).

Psychological distress

Looking at the raw mean scores, females reported significantly more mental distress than males (p<0.05 for all dimensions, see Table 3). The highest raw mean scores for males and females were on the dimensions of hostility, depression and obsessive-compulsive disorder.

The study sample was compared with a normative sample of adolescents from the general population in the US. Scores for each individual from the study on each domain that was 2 SD above the norm for the general population sample of adolescents were identified (see Table 4). These individuals' scores, by definition, were in the upper 2.3% of the normative sample for that domain. From Table 4, it can be seen that:

- significantly more females (40%) than males (14%) had a GSI 2 SD above the population norm;
- for seven out of nine domains, at least one-fifth of the females' scores were in the top 2.28% of the population;
- females were most likely to have scores 2 SD above the population norm for the domains of hostility (32%) and depression (26%);
- generally, less than 10% of the males had domain scores that were 2 SD above the population norm; and
- males were most likely to be in the top 2.28% on hostility (14%).

In sum, a significantly greater proportion of the females (56%) than males (25%) were classified as 'cases' or at risk, as defined above (χ^2= 12.1, df=1, p=0.0005).

Table 5: Correlates and multivariate predictors of heroin use adjusting for benzodiazepine use.

Variable	Heroin		Multivariate analysis		
	Users n=79 Mean[a]	Non-users n=42 Mean	*p*	Odds Ratio[c]	95% CI
Benzodiazepine use%	47	21[b]	0.4	0.6	0.3-1.1
Criminal behaviour	5.6	3.3[b]	0.0009	1.4	1.2-1.5
Physical health	19.2	13.1[b]	0.0005	1.2	1.1-1.2
HIV risk-taking	9.9	4.4[b]	0.02	1.1	1.1-1.2
Psychological distress	1.1	1.1	0.01	0.3	0.2-0.5
Social dysfunction	21.9	23.0	0.005	0.9	0.8-0.9

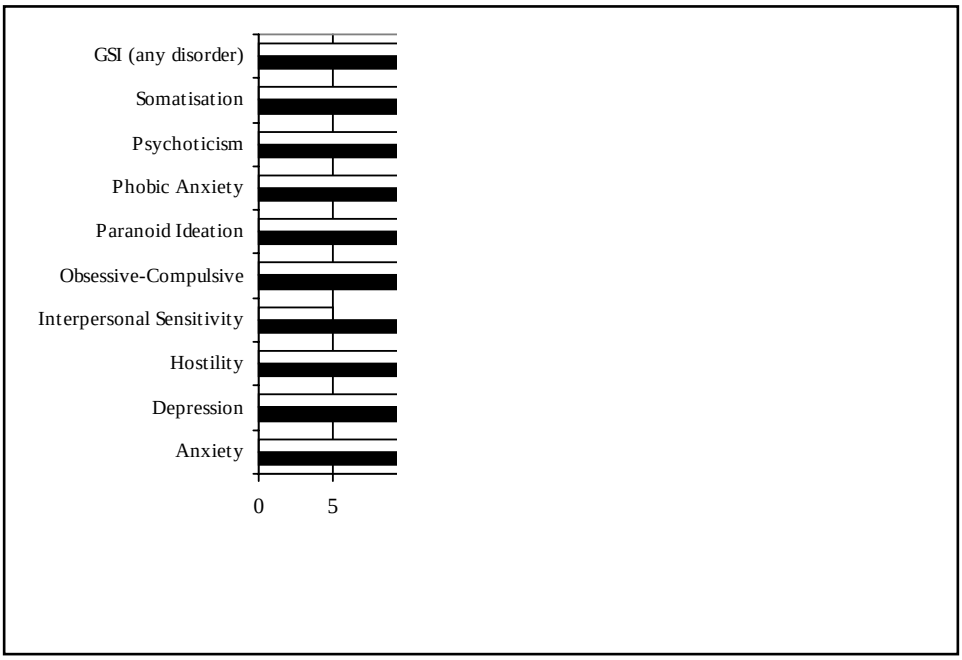
Notes:

(a) Higher mean scores on scales indicate poorer functioning, i.e. more involvement in criminal behaviour, more physical health symptoms, more HIV risk-taking, more psychological distress and poorer social functioning.

(b) Univariate difference significant at p<0.05 level.

(c) Some odds ratios equal the extreme of the confidence interval due to rounding.

Figure 1: Percentage of heroin users and non-heroin users rated as cases for each psychological disorder scored by the SCL-90-R.



Predictors of heroin use

Predictors of heroin use were investigated because of the increase in heroin use and associated problems since the early 1990s (discussed above). A multivariate logistic regression model, with heroin use as the dependent variable, was tested. The independent variables were five substance-use-related problems: HIV risk-taking behaviour, social dysfunction, criminal behaviour, physical health and psychological distress. Benzodiazepine use was added to the model because of its significant correlation with heroin use, so that the model would identify predictors of heroin use after accounting for benzodiazepine use. The model was significantly superior to a constant only model (χ^2=45.8, *df*=5, $p<0.00001$) and correctly predicted 81% of the cases. None of the variables were removed from the model because of non-significance. After adjusting for benzodiazepine use, heroin use was positively associated with criminal behaviour, HIV risk-taking and the number of physical health symptoms. Heroin use was negatively associated with social dysfunction and psychological distress (see Table 5). The odds ratios of 0.9 for social dysfunction suggested that there was little change in the likelihood of using heroin on the basis of a one-unit change on the social functioning scale. After adjusting for all other variables in the model, the likelihood of being a heroin user was reduced by one-third for each unit increase on the GSI (the measure of psychological distress), increased by about one half for each unit increase on the crime scale, increased by about one-fifth for each additional physical health symptom and increased by about one tenth for each additional point on the HIV risk-taking scale. Chi-square analyses identified that the types of crime that were significantly more likely to be committed by heroin users relative to non-heroin users were dealing (63% compared with 26%, p=0.0001) and fraud (27% compared with 9%, p=0.03). There were no significant differences in the rates of property crime, nor crimes involving violence between the two groups ($p>0.05$).

Some of the multivariate findings appeared to contradict relationships identified by univariate methods (see Table 5). For example, chi-square analysis identified that heroin users were significantly more likely to be using benzodiazepines than non-heroin users (χ^2=7.4, *df*=1, p=0.006). It appears that the concurrent use of heroin and benzodiazepines was related to other factors in the model such as psychological distress (see below). A univariate *t*-test for independent means had identified no significant difference between heroin users and the rest of the sample in the GSI (p=0.9). Figure 1 illustrates the nature of the unadjusted differences in the psychological distress between heroin users and study participants who did not use heroin. Figure 1 contains the percentage of heroin users and non-heroin users whose scores for each domain were high enough to be classified as a likely 'case' for that psychological disorder. It appears that the main source of psychological distress for heroin users was somatisation. The multivariate model accounted for physical health symptoms, so heroin users appeared less psychologically distressed.

In summary, the analyses suggested that, after adjusting for benzodiazepine use, heroin users were:

a) more involved in crime and HIV risk-taking and had more physical health symptoms than non-heroin users; and
b) more socially functional and less psychologically distressed than non-heroin users.

However, the difference in social dysfunction was small. Furthermore, the difference in psychological functioning seems to have been the result of the multivariate model accounting for physical health symptoms, which would have been contributing to the high rates of somatisation among heroin users.

Predictors of benzodiazepine use

A similar multivariate logistic regression was used to identify predictors of benzodiazepine use. Predictors of benzodiazepine

use were investigated because it had been found to be a 'marker' for problems among adults in PSUD-treatment interventions. It was hypothesised that benzodiazepine use could also be a marker for problems among adolescents seeking treatment. Independent variables were the five substance-use-related problems (as above), plus heroin use, so that the model was not affected by the significant correlation between benzodiazepine use and heroin use. The full model was significantly better than a constant only model (χ^2=22.0, *df*=5, p<0.0005). Three variables were removed from the model due to non-significance after adjusting for heroin use: social dysfunction, criminal behaviour and physical health symptoms. While criminal behaviour and physical health symptoms were significantly associated with benzodiazepine use in univariate tests, these relationships became non-significant in the multivariate model. Social dysfunction was not significantly associated with benzodiazepine use in the univariate or the multivariate tests. Removal of non-significant variables from the full model reduced the prediction rate of the model from 77% to 74% but did not significantly change the goodness of fit of the model (χ^2=2.9, *df*=3, p>0.1). After adjusting for all other variables in the model, the likelihood of being a benzodiazepine user was nearly doubled for each unit increase on the GSI (the measure of psychological distress). The odds ratio of 1.1 for HIV risk-taking suggested that there was little change in the likelihood of using benzodiazepines on the basis of a one unit change on the HRBS, after adjusting for heroin use and psychological distress (see Table 6).

Discussion

Substance use patterns

The patterns of substance use by the sample were indicative of significant abuse and dependence. About half the sample had been using heroin on a daily basis, paralleling reports of increased heroin use among young people in Sydney.[39] The majority of the sample was smoking an average 16 cones of cannabis a day. Alcohol use could be characterised as 'binge drinking': large amounts consumed, but not on a daily basis. Scores on the SDS reflected the high levels of use and suggested that most, if not all, the study participants could be described as substance dependent. These patterns of use were the same for males and females. The lack of gender differences in the patterns of use raises particular concerns. From equivalent amounts of substance use, females are more susceptible to adverse consequences than males.[40] From the substance use patterns alone, it would be expected that the sample would have experienced considerable substance-related harm and would be at high risk of further harm if the use continued.[41-43]

Extent of problems

Opiate Treatment Index

It is difficult to appreciate the meaning of the scores on the OTI subscales without comparisons with other samples. Such comparisons were made with an Australian study using the OTI with a sample of 290 opioid users, 230 of whom were in treatment, while the other 60 were recruited through needle exchanges.[24] The main differences between the adolescent sample and the adult sample were that the adolescents had:

- lower HRBS scores indicating lower HIV risk *(M*=8.0, SD=6.5 compared with *M*=9.0, SD=7.1);
- higher social functioning scale scores indicating poorer social functioning *(M*=22.3, SD=5.5 compared with *M*=20.5, SD=7.2);
- higher crime scale scores indicating more involvement in crime *(M*=4.8, SD=3.1 compared with *M*=1.0, SD=1.7); and
- more physical health symptoms *(M*=17.0, SD=8.7 compared with *M*=12.6, SD=7.6).

The lower mean score on the HRBS was probably due to the lower proportion of current (in last month) injectors in the adolescent sample (53%) relative to the adult sample (77%). Among the subsample of injectors from the adolescent sample (n=64), the proportion of injectors who had lent needles to others (14%) was similar to rates found in adult samples and the proportion who admitted to lending needles to others (31%) was substantially higher than found in adult samples. HIV risk was also significant among the sexually active, with more than half not using a condom every time they had sex with a casual partner. In sum,

Table 6: Correlates and multivariate predictors of benzodiazepine use, adjusting for heroin use.

Variable	Benzodiazepine		Multivariate analysis		
	Users n=46 Mean[a]	Non-users n=75 Mean	*p*	Odds Ratio[c]	95% CI
Psychological distress	1.3	1.0[b]	0.01	1.9	1.4-2.6
HIV risk-taking	11.4	6.0[b]	0.002	1.1	1.1-1.2
Social dysfunction	23.4	21.6	ns		
Criminal behaviour	6.0	4.2[b]	ns		
Physical health	20.8	14.8[b]	ns		

Notes:
(a) Higher mean scores on scales indicate poorer functioning, i.e. more involvement in criminal behaviour, more physical health symptoms, more HIV risk-taking, more psychological distress, poorer social functioning.
(b) Asterisk denotes univariate difference significant at p*<0.05 level.*
(c) Some odds ratios equal the extreme of the confidence interval due to rounding.

while the overall HRBS score suggested low risk for HIV, a closer observation of the behaviours of injectors and the sexually active indicated that the risk of transmission of HIV, and other transmissible diseases such as hepatitis, was significant within the adolescent sample.

SDS

SDS scores from this study sample were compared with scores from samples of heroin users in methadone maintenance,[23,27] amphetamine users[27] and long-term cannabis users.[35,44]

The adolescent sample's mean score on the SDS (*M*=9.3, SD=2.9) was substantially higher than the mean scores of the other samples, which ranged from 4.1 to 5.2. This finding suggested that the adolescent treatment-based sample had higher levels of substance dependence relative to adult substance users in and out of treatment. The experience of withdrawal symptoms could provide a substantial disincentive to these young people to enter and stay in treatment as well as negatively affecting treatment outcome and relapse.

Psychological distress

The GSI mean scores from the SCL-90-R of the sample from this study were compared with scores from samples of adolescents in the general population,[29] adults in methadone maintenance,[28] and adolescents in school and in treatment.[30] The adolescents in this study had a higher GSI mean score (*M*=0.87, SD=0.56 for males, *M*=1.35, SD=0.77 for females) than samples of school students (*M*=0.63, SD=0.52 for males, *M*=0.85, SD=0.54 for females), clients in methadone maintenance (*M*=0.72, SD=0.52 for males, *M*=1.13, SD=0.75 for females) and adolescent students and treatment referrals (separate means were provided for six categories from abstainers to very high substance users: *M*=0.35-0.61 for males, *M*=0.46-1.18 for females).

This study's adolescent treatment-based sample had very high levels of psychological distress, suggesting that counselling and/or psychiatric treatment would often be a necessary part of treatment. The higher GSI scores among benzodiazepine users suggested that this group was in particular need of such services.

In the context of previous research on the poor mental health of methadone patients,[45] the finding that heroin users reported less psychological distress than the rest of the sample was not expected.

The profile of distress reported by the study participants suggested that heroin users were particularly prone to distress relating to somatisation and that non-heroin users were particularly experiencing distress related to hostility. This pattern was consistent with other data. The high levels of somatisation among heroin users was consistent with the larger number of physical health symptoms reported by heroin users relative to non-heroin users. The higher prevalence of hostility among the non-heroin users was consistent with the negative association between heroin use and alcohol use, and the association between alcohol and violence reported by previous research.[46] In sum, psychological distress was high for the whole sample, however the extent and nature of this distress appeared to be related to the type of substance used such that non-heroin users (typically binge drinkers) would be expected to exhibit more hostility and heroin users would be expected to exhibit more distress relating to physical health problems.

Gender

Within the adolescent sample, females had a higher risk of transmission of HIV, poorer social functioning and poorer physical health than the males. The females were also significantly more psychologically distressed than the males, even after taking into account expected gender differences from population norms. The reason for these differences is unclear. In regard to psychological distress, social and/or biological factors could make males less likely to be distressed, or to express distress, about problems relating to substance abuse/dependence than young females. Alternately, young females might experience worse psychological consequences of substance abuse/dependence than young males. While prostitution was rare among the study participants, females could have been more likely to have been sexually exploited than the males. The higher rates of impending charges against males than females could be a factor: the juvenile justice system could be getting young people into treatment earlier than if they had not been charged with an offence. Females could have been more supported by family or partners than males and the problem might need to be significantly worse for females before these supports will resort to professional help. This is an area for further investigation.

Treatment prognosis

The adolescents in this sample had high scores on all of the risk factors for poor prognosis in treatment. Those who used heroin, a substantial proportion of the sample, appeared to be at even greater risk of concurrent involvement in crime. Those who used benzodiazepines appeared to have poorer psychological functioning. Higher levels of involvement in crime, psychological dysfunction and substance use have been identified as markers for treatment failure.[8,10,11] It is important in terms of responsibility to funding bodies, the morale of staff and the self-efficacy of clients that realistic objectives are set. Overly ambitious objectives could set up programs and their clients for failure. No program is likely to provide a 'miracle cure', such as abstinence for all clients.

Some would argue that adolescents with such poor prognosis should be excluded from treatment and that treatment resources are better spent on adolescents who are more likely to benefit. However, we have a duty to care for all adolescents.[47] Furthermore, treatment is likely to be beneficial: Outcome studies have suggested that PSUD-treatment interventions are associated with positive outcomes.[48] As expressed by Catalano and colleagues: 'some treatment is better than no treatment', even though the occurrence of relapse is high.[49] It is likely that adolescents such as those involved in this research study could benefit if appropriate treatment was provided.

Treatment needs

The adolescents from this study appeared to need a compre-

hensive, intensive and long-term intervention to assist with the number and severity of signs and symptoms of distress. While there has been some debate about the issue of treatment matching, it is commonly accepted that the intensity and duration of treatment needs to increase as problem severity increases.[3-5] While residential treatment is more expensive per client per day than non-residential treatment,[6] intensive residential treatment has been advocated when intrapersonal, interpersonal and environmental factors are particularly dysfunctional.[4] The significance of substance-using peers in the lives of the sample, identified by the Social Functioning Scale, suggested that time-out from such influences and development of new non-substance-using peer networks, could be an important part of treatment. A short period of residential treatment (up to three months) could provide the time-out from environmental factors that contribute to the drug problems and an opportunity for stabilisation, prior to a longer period of non-residential treatment in the community.

Whether treatment is residential or non-residential, it is recommended that treatment include a comprehensive range of interventions to address the multiple problems associated with PSUDs. For example, a comprehensive treatment program could include: relapse-prevention-skills training to assist with managing drug use, health education to encourage safer sex and safer injecting, vocational assistance and recreational programs to encourage societal reintegration, medical assessment and treatment to address physical health problems, psychiatric screening and referral to address psychological distress, and social skills training and family interventions to improve social functioning.

Finally, these adolescents require sustained treatment and support while in the community. Even several months in a residential facility is not sufficient for positive outcomes in the long-term. Adolescents need to be nurtured and supported to deal with their own problems, as well as with an increasingly difficult and hostile society.[50,51]

Conclusions

The adolescents in this study tended to be poly-substance users, with cannabis, heroin and alcohol the main substances used. Heavy use in terms of frequency and amounts of use were reported. The profile of the group was highly problematic in the areas of substance dependence, social functioning, criminal behaviour, psychological distress, physical health and HIV risk. This profile suggested that improvements would be likely to be difficult to achieve and maintain.

Recommendations

It is recommended that a comprehensive, intensive, longer-term PSUD-treatment intervention is needed to address the variety and severity of problem areas evident in the sample. It is further recommended that greater attention be given to earlier community-based interventions to prevent drug abuse and related problems among at-risk adolescents from escalating to the levels seen in this sample. Schools, police, community services, health workers and the juvenile justice system are in a position to identify and intervene with the adolescents and their families long before they present to a residential treatment program.

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