

Polysubstance use in young people accessing residential and day-treatment services for substance use: substance use profiles, psychiatric comorbidity and treatment completion

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Funding information

None.

Abstract

Background and Aims: People with substance use disorders (SUDs) frequently present to treatment with polysubstance use and mental health comorbidities. Different combinations of substance use and mental health problems require different treatment approaches. Our study aimed to: (i) identify the shared substance use classes among young people at treatment admission, (ii) determine which mental health symptoms, quality of life (QoL) and service types were associated with the identified substance use classes, and (iii) prospectively determine which substance use classes and service types were more likely to complete treatment.

Design: Cross-sectional and prospective study using service and outcome data.

Setting: Substance use treatment services in Queensland and New South Wales, Australia.

Participants: De-identified service and outcome measure data were extracted from the files of 744 clients aged 18–35 years (48% male) admitted into seven residential and four day-treatment programmes.

Measurements: Substance use and severity among tobacco, alcohol, cannabis, cocaine, amphetamine-type stimulants, opioids, sedatives and inhalants. Other variables included: depression, anxiety, post-traumatic stress and psychotic symptoms, as well as QoL.

Findings: Latent class analysis identified three polysubstance use classes: wide-ranging polysubstance users (WRPU; 22.45%), primary amphetamine users (56.45%) and alcohol and cannabis users (21.10%). The WRPU class had higher odds of psychotic symptoms than the alcohol and cannabis use class [odds ratio (OR) = 1.30; 95% confidence interval (CI) = 1.11–1.11]; and double the odds of residential programme enrolment than those in the amphetamine use class (OR = 2.35; 95% CI = 1.50–3.68). No other class differences on mental health or QoL variables were found. Clients enrolled in day-programmes had higher odds of completing treatment.

Conclusions: There appear to be high levels of polysubstance use among young people entering substance use treatment in Australia. Wide-ranging polysubstance users were more likely to report psychotic symptoms and be enrolled into a residential programme than primary amphetamine users and alcohol and cannabis users.

KEYWORDS

Comorbidity, outpatient treatment, polysubstance use, psychosis, residential treatment

INTRODUCTION

The demand for treatment of substance use disorders (SUDs) greatly outweighs the resources available world-wide [1, 2]. Attrition rates can be higher than 50% in the first month of treatment [3, 4]; relapse rates as high as 85% have been reported following a first treatment episode [5] and treatment outcomes beyond 12 months are largely unknown [6]. Limited information is available regarding which substance use treatments or services may be most effective for different types of presentations, particularly those with polysubstance use and comorbid mental health problems [7, 8]. The objective of this study was to more clearly understand the substance use characteristics of people entering and completing substance use treatment to inform referral pathways and the development of more individualized intervention approaches.

People entering treatment services commonly report using multiple substances (polysubstance use) on the same or separate occasions [9]. Certain combinations of substances have countering effects on the central nervous system, and may be used to manage withdrawal or the sedating impacts of a substance (e.g. methamphetamines followed by opioids [10, 11]). Conversely, combining substances with similar psychoactive effects may enhance their benefits. For example, using alcohol alongside benzodiazepines augments the sedating properties of each substance [10]. Polysubstance use disorders are more difficult to treat than single SUDs, and are associated with more adverse substance use, mental health and physical health outcomes [12–14].

SUDs are highly comorbid with other mental health disorders [15, 16], particularly among polysubstance users [17]. Comorbid presentations in treatment are diverse, and most commonly include mood [18, 19], anxiety [20, 21], eating [22] and post-traumatic stress disorders (PTSDs) [23, 24]. There is also a high prevalence of positive psychotic symptoms and schizophrenia [25, 26]. The relationship between mental health and SUDs is bidirectional [27–30], and different mental health symptoms may be associated with using different clusters of substances to achieve the desired effects (e.g. for intoxication, energy or alleviating distress [31]). Substance use problems and disorders reach their peak between 18 and 25 years of age, but the average age for first receiving substance use treatment is 34 years [32–34]. Despite this, few studies have investigated the effectiveness of substance use treatment in this age group. For young people with severe and complex substance use, residential treatment is a common recovery pathway [6, 35]. Services provide live-in treatment through structured group and individual programmes delivering

psychoeducation, counselling and recovery support throughout a specified time-period. There is limited quality of evidence for the effectiveness of residential treatment for substance use problems [6]. People who receive it tend to achieve positive outcomes, particularly if they complete treatment [6]. However, little is known about what types or length of residential treatment are most effective, or which individuals are more likely to complete treatment. Day-services are also available, which deliver structured group programmes for a specified length of time while individuals live in their usual environment. Even less is known about the outcomes of these programmes, including which people are most likely to benefit from or complete treatment. Focusing upon day and residential modalities is important, due to many substance use programmes utilizing this structure. Furthermore, day-programmes are increasing in popularity. However, little is known about the characteristics of people attending them, and whether their outcomes differ from residential treatment modalities.

Latent class analysis (LCA) is a person-centred statistical approach which identifies clusters of individuals (also known as classes) that have similar patterns of substance use [36]. This approach can help to characterize heterogeneous populations such as people in treatment for SUDs. Existing research utilizing LCA has typically examined substance use classes in nationally representative general population samples [37, 38], which have limited applicability in treatment settings.

Two studies have used LCA to identify substance use classes among people in substance use treatment. A study conducted among 825 people seeking outpatient treatment for cannabis use found a wide-ranging substance use class, a cannabis, alcohol and tobacco class and a cannabis and tobacco class [39]. A second study conducted in 493 women accessing substance use treatment services found a four-class solution, including amphetamine polysubstance users, alcohol users, cannabis and alcohol users and other polysubstance users [40]. Both studies examined the association between the identified substance use classes and mental health outcomes. Connor *et al.* [39] found the wide-ranging substance use class had more severe depression, anxiety, positive psychotic and manic symptoms than those in a cannabis, alcohol and tobacco class and more severe anxiety than the cannabis and tobacco class. Rodriguez *et al.* [40] found the amphetamine polysubstance use class reported higher levels of psychological distress than the alcohol-only class at service entry. Those in the amphetamine polysubstance use class had better psychological distress and quality of life (QoL) outcomes than those in the alcohol-only class after 60 days of treatment. Finally, a LCA study focusing on QoL outcomes among 9958 people attending various

substance use services found that both substance use and psychological distress was highest in the low QoL class [41]. Together, research suggests that polysubstance users are likely to have poorer mental health and QoL outcomes more broadly, which may negatively impact the trajectory of treatment. However, these studies were conducted among treatment-seeking samples of cannabis users [39] and women who completed routine outcomes at service entry and after 60 days within treatment [40]. Research is yet to identify substance use classes or their association with mental health symptoms, QoL or treatment completion in a large sample of young men and women receiving treatment for a broad range of substances in residential and day-programmes.

The current study aimed to: (i) identify the substance use classes of young people (aged 18–35 years) entering residential or day-treatment programmes for substance use; (ii) determine how mental health symptoms, QoL and service type (residential or day-programme) are associated with these substance use classes; and (iii) prospectively determine which substance use classes and service types are more likely to complete the treatment episode. The outcomes of this study will have broad implications for treatment services.

We expect:

- (i) to identify multiple latent classes that reflect the complexity of treatment-receiving individuals with SUDs, and
- (ii) that the presence of more severe depression, anxiety, post-traumatic and psychotic symptoms will be associated with wider range polysubstance use classes.

Given that people who access residential treatment tend to have more severe substance use, we anticipate that:

- (iii) classes characterized by greater polysubstance use will be less likely to complete treatment.

METHOD

Procedure and setting

We obtained de-identified routinely collected data from 744 clients aged 18–35 years [mean^{age} = 28.30, standard deviation (SD) = 4.28] out of a total of 1671 people who were admitted into 11 treatment services for substance use between March 2020 and April 2021. Only 744 individuals aged between 18 and 35 years were included in this study. Treatment services included seven residential and four day-programmes in Queensland and northern New South Wales, Australia. All services run 6-week rehabilitation programmes predominantly comprised of group-based treatment, case management, counselling support and referrals to specialist support (e.g. psychiatry). In cases of multiple admissions, the client's first admission data were included. Clients completed self-report outcome measures upon service entry as part of the standard service entry process. Individual consent was

not obtained prior to sourcing the data, as participants consent to their de-identified data being utilized for research purposes at service entry. Treatment cessation data (treatment completion and reason for dropout) were extracted in late August 2021. Ethical approval was obtained from the University of Queensland Human Research Ethics Committee. The analysis was not pre-registered, and our results should be considered exploratory.

Measures

Demographic and treatment information

Demographic information included age, sex, source of income, employment, reason for treatment cessation and the primary substance for which participants sought treatment. Treatment completion was defined as clients who completed a single treatment episode without involuntary or voluntary discharge from the service.

Substance use

Substance use severity was measured using the alcohol, smoking and substance involvement screening test (ASSIST [42]). This measure assessed past 3-month frequency of use of eight different substance use types (tobacco, alcohol, cannabis, cocaine, amphetamine-type stimulants, opioids, sedatives and inhalants). Seven additional questions evaluated the consequences of each substance used in the past 3 months. A total individual score was obtained for each substance (ranging from 0 to 39) that is then categorized by severity based on World Health Organization (WHO)-recommended ranges [42]. For alcohol, a score of 0–10 is low risk, 11–26 moderate risk and 27+ high risk. For all other substances, 0–3 is categorized as low risk, 4–26 moderate risk and 27+ high risk. Scores were categorized as low, medium and high based on this severity for each drug and were used in a LCA (Aim 1).

Mental health symptoms and QoL

Participants completed the primary care PTSD screen for DSM-5 (PC-PTSD-5; a five-item measure for PTSD symptoms associated with experiencing a traumatic event [43]), the generalized anxiety disorder scale (GADS; a seven-item measure of generalized anxiety during the past 2 weeks [44]), the patient health questionnaire (PHQ; a nine-item measure of depressive symptoms during the past 2 weeks [45]), the psychosis screener (PS; a seven-item measure of psychotic symptoms during the past 12 months [46]) and the Australian treatment outcomes profile QoL scale (a 10-item measure of overall QoL based on physical and psychological wellbeing [47]). Total scores on all measures were used in the analyses. Higher scores indicated higher mental health symptom severity and poorer QoL. Positive psychotic symptoms are indicated by a score of three or more on the PS.

Statistical analyses

Data were analysed using Mplus [48] and Stata [49]. LCA was conducted to identify the substance use classes of people entering residential or day-treatment programmes for substance use (Aim 1). Participants were classified into their latent subgroups based on substance use severity on the ASSIST (low, medium, high) among seven substances: tobacco, alcohol, cannabis, cocaine, amphetamine-type stimulants, opioids and sedatives. LCA identified clusters of substance users based on the similarities of their responses on each substance use type. The analysis was performed iteratively through two- to six-class models. The optimal class solution was determined based on the Akaike's information criterion (AIC), Bayesian information criterion (BIC) and sample size-adjusted BIC (SSaBIC) compared across classes, where a lower value indicates a balance between model fit and parsimony [50, 51]. The Vuong-Lo-Mendell-Rubin (LMR-LRT) ratio test and adjusted ratio tests were used to evaluate the improvement of model fit between classes [52]. A significant LMR-LRT *P*-value indicates that the inclusion of one more class (*k* class model) fits better than a *k*-1 class model [50]. Classification quality was evaluated through entropy, where values range from 0 to 1, and an entropy value closer to 1 indicates a clear separation of classes.

The association between class type, mental health, enrolment service type and QoL (Aim 2) was investigated using a multinomial logistic regression (controlling for age and sex). Substance use classes were used as the outcome variables. Mental health, enrolment service type and QoL were used as predictor variables (see Table 4). A separate logistic regression analysis investigated the association between substance use class on treatment completion (yes/no) (Aim 3). Multiple comparisons were corrected using a Bonferroni adjustment ($\alpha^{\text{altered}} = 0.05/24$) setting the significance level at 0.00208. Missing values for mental health and QoL outcomes (*m* = 98) were imputed prior to the multinomial logistic regression analysis using the iterative Markov chain Monte Carlo method in Stata [53]. No other missing data were present. Class uncertainty was accounted for by using a weighted analysis with BCH (Bolck, Croon & Hagenars) weights from each latent class [54].

RESULTS

Client characteristics

Information on demographic, mental health, QoL and primary substance use variables is presented in Table 1. Clients (*n* = 744) were primarily admitted to a residential treatment service (*n* = 519), and 321 clients (43.10%) completed treatment. Information on the sex, age and primary substance type of all clients admitted to the services during the study time-frame is provided in Supporting information, SS2. There were differences in age, but no differences in sex between the sample used for the analysis and all clients admitted into the service.

Primary reasons for treatment cessation included: non-compliance (e.g. displays of aggression; *n* = 97), treatment cessation against formal advice (*n* = 65) and leaving without notice (*n* = 53). The mean anxiety and depression scores were above moderate to severe clinical cut-offs [55, 56]; 43.68% of people screened positively for PTSD on the PC-PTSD-5 and 13% screened positively on the PS.

Aim 1: LCA of substance use classes

Model fit statistics for each class are presented in Table 2. The three-class solution produced the lowest BIC. Based on LMR-LRT values, the four-class model did not fit the data better than the three-class model and the three-class model did not fit the data better than the two-class model. The six-class solution produced the lowest AIC and SSaBIC. Fit statistics varied considerably for the five- and six-class solutions, were very close for the four- to six-class solutions and the LMR tests indicated improvements with each increase in class. Additions in class did not indicate an improved model fit, and each increase in class size separated the substances into more distinct categories through isolating substances, which was inconsistent with our research aims to investigate shared substance use classes. Therefore, the classes were examined based on interpretability [48]. The three-class solution was selected as the optimal solution, as it yielded clear classification between substance groups which was more parsimonious, interpretable and provided adequate class sizes.

Figure 1 shows the probability of substance use for each class. Class 1 was characterized by wide-ranging substance use (WRPU) across all categories except cocaine, with high engagement with alcohol, amphetamine and cannabis and moderate engagement with sedatives and opioids, with a prevalence estimate of 167 (22.45%). Class 2 was characterized by high amphetamine use, moderate tobacco and cannabis use and low involvement across all other substance use categories (primary amphetamine use class). The prevalence estimate for this class was 420 (56.45%). Class 3 was characterized by using predominantly alcohol, followed by cannabis and tobacco and no involvement with other substances (alcohol and cannabis use class). The prevalence estimate for this class was 157 (21.10%). All classes engaged in tobacco use, with the WRPU having the greatest engagement.

Aim 2: Association between substance use class, mental health symptoms, QoL and service enrolment type

Class differences on demographics, mental health variables, program enrolment and completion are reported in Table 3.

We conducted multinomial logistic regressions with simultaneous entry to examine whether the severity of mental health symptoms, QoL and enrolment service type of clients was associated with substance use class membership (Table 4).

TABLE 1 Demographic, mental health, quality of life (QoL) and primary substance type for the current treatment episode of people attending residential and day substance use treatment services aged 18–35 years

Demographic factors			
Characteristic	Total sample (n = 744)	Residential programme (n = 519)	Day programme (n = 225)
Age, mean (SD)	28.3 (4.28)	28.15 (4.29)	28.65 (4.23)
Sex, n (%)			
Male	354 (48)	242 (47)	112 (50)
Female	390 (53)	277 (53)	113 (50)
Income source (%)			
Full-time employment	34 (5)	12 (2.3)	22 (10)
Part-time employment	28 (4)	15 (3)	13 (6)
Unemployment benefit	527 (71)	387 (75)	140 (62)
Pension (aged, disability)	72 (10)	49 (9)	23 (10)
No income	14 (2)	14 (3)	
Other/not stated	69 (9)	42(8)	24 (10)
Treatment completion (%)	321 (43)	209 (40)	112 (50)
Substance use			
Primary drug type, ^a n (%)			
Amphetamine-type stimulants (methamphetamine, MDMA, amphetamines)	389 (52)	262 (51)	127 (57)
Methamphetamine	375 (50)	254 (49)	121 (54)
Amphetamines (including speed)	10 (2)	6 (1)	
Alcohol	194 (26)	153 (30)	42 (19)
Cannabinoids	89 (12)	55 (11)	34 (15)
Heroin	12 (2)	10 (2)	
Opioids (buprenorphine, fentanyl, morphine, oxycodone)	10 (2) ()	10 (2)	
Benzodiazepines	16 (2)	12 (2)	
Gamma-hydroxybutyric acid	8 (1)	6 (1)	
Cocaine	8 (1)		
Other	18 (2)	7 (1)	10 (4)
Injecting drug use (n)			
Life-time	129	85	44
Past 3 months	243	170	73
Mental health, QoL, mean (SD)			
Depression	13.85 (7.13)	14.12 (7.31)	13.29 (7.16)
Anxiety	11.39 (6.32)	11.66 (6.42)	10.62 (6.04)
PTSD	2.46 (2.16)	2.44 (2.15)	2.50 (2.17)
Positive screen ^b n (%)	325 (43.68)	222 (42.77)	103 (45.77)
Psychosis	1.44 (1.57)	1.46 (1.56)	1.39 (1.59)
Positive screen ^c n (%)	97 (13.03)	69 (13.29)	28 (12.44)
QoL	5.06 (2.94)	4.39 (2.98)	4.59 (2.82)

Blank cells are estimates fewer than five people and were removed to maintain patient confidentiality.

^aAs indicated by asking clients for the substance they are seeking treatment for during the current treatment episode;

^bas indicated by a score of three or more on the primary care post-traumatic stress disorder (PC-PTSD)-5 and

^cthree or more on the psychosis screener.

Males had lower odds of belonging to the amphetamine use class [odds ratio (OR) = 0.53, $P = 0.001$; 95% confidence interval (CI) = 0.36–0.78] compared to the alcohol and cannabis use class.

Attending a residential programme was associated with a significant increase in the odds of belonging to the WRPU class (OR = 2.35, $P < 0.001$; 95% CI = 1.50–3.68) compared to the amphetamine use

TABLE 2 Model fit indices of two to six classes

Classes	AIC	SSaBIC	BIC	LMR test	LMR P-value	Adjusted LMR	Adjusted LMR P-value	BLRT	BLRT P-value	Entropy
2	9224.536	9271.947	9376.734	-4835.165	0.000	507.280	0.000	-4835.165	0.000	0.803
3	9134.907	9206.741	9365.510	-4579.27	0.114	122.539	0.116	-4579.268	0.000	0.712
4	9057.030	9153.287	9366.037	-4517.45	0.166	110.891	0.168	-4517.454	0.000	0.708
5	9029.867	9150.547	9417.278	-4461.52	1.000	60.624	1.000	-4461.515	0.000	0.706
6	9001.382	9146.486	9467.198	-4430.93	0.977	61.934	0.978	-4430.933	0.000	0.782

AIC, Akaike information criterion; BIC, Bayesian information criterion; BLRT, bootstrap likelihood ratio test; LMR, Vuong-Lo-Mendell-Rubin ratio test; SSaBIC, sample-size-adjusted BIC.

class. Individuals with a higher psychosis score were more likely to belong to the WRPU class (OR = 1.30, $P = 0.001$; 95% CI = 1.11–1.11) than the alcohol and cannabis class.

Aim 3: Association between substance use class and treatment completion

A separate multinomial logistic regression analysis investigated whether substance use class prospectively predicted treatment completion (Aim 3). Substance use class was not a significant predictor of treatment completion (the Results Table is presented in Supporting information, SS1).

DISCUSSION

The first aim of this study was to identify the substance use classes of young people entering substance use treatment services. LCA identified a three-class solution: (i) a WRPU class that had high past-3-month use among most substance types, characterized by severe alcohol and amphetamine use, in addition to elevated cannabis and opioid use, (ii) a primary-amphetamine use class, representing more than half of the sample, characterized predominantly by amphetamine use alongside low-level use of cannabis and alcohol and (iii) a cannabis and alcohol use class, the least prevalent in the sample, characterized by high alcohol and cannabis use and moderate tobacco use.

While LCA findings are difficult to compare, our identified classes are similar to a study conducted in women accessing substance treatment services which found a four-class solution, including amphetamine polysubstance users, an alcohol-only class, a cannabis and alcohol class and other polysubstance users [40]. Epidemiological studies utilizing LCA have also found three class solutions that include wide-ranging substance users (including polysubstance use involving legal and illegal substances), amphetamine-only users and a class characterized by more commonly used substances (e.g. alcohol, tobacco and cannabis use [10, 37]).

The second aim examined the association between substance use class, mental health symptoms, QoL and service type. The WRPU

class had 1.3 times the odds of experiencing psychotic symptoms than the alcohol and cannabis class. No other significant differences in the mental health symptoms or QoL were found across classes. This is partially consistent with our hypothesis, based on previous research in treatment-specific settings, that the WRPU class would display more severe depression, anxiety, PTSD and psychotic symptoms [39, 40]. Connor *et al.* [39] also found that wide-ranging substance users were more likely to have positive psychotic symptoms than a cannabis, alcohol and tobacco class. However, previous research used different measures of depression and anxiety symptoms (e.g. Kessler [10], general health questionnaire) and did not include a measure of PTSD symptoms. Moreover, all classes in our study showed above moderate mental health symptoms, suggesting that further research is needed among treatment-receiving groups of substance users, as comorbidity of SUD and mental health problems occurred throughout all classes.

The WRPU class engaged in severe amphetamine use in addition to cannabis, alcohol and opioid use. The dose–response relationship between psychotic symptoms and disorders in amphetamine and cannabis use is well established [57, 58]. Amphetamine use alone or in combination with cannabis may increase the risk of psychotic symptoms [29]. However, the primary-amphetamine use class (with moderate cannabis use) did not report more psychotic symptoms than either the WRPU or alcohol and cannabis class. This suggests that the sheer magnitude of polysubstance use in the WRPU class may have increased the risk of psychotic symptoms, rather than the effects of a specific substance. Polysubstance use could therefore also be a marker of increased vulnerability to psychopathology overall. Alternatively, polysubstance users may use multiple or different combinations of substances to self-regulate mental health symptoms, reduce withdrawal symptoms or enhance the effects of a certain substance [27, 28, 59].

Regarding gender-specific differences, males had lower odds of belonging to the alcohol and cannabis class than the class of primary-amphetamine use, and approached significance compared to the WRPU class. This may reflect the higher rates of life-time and past 12-month amphetamine use found in males compared to females in the general population [60].

As anticipated, people attending a residential programme had double the odds of belonging to the WRPU class compared to the

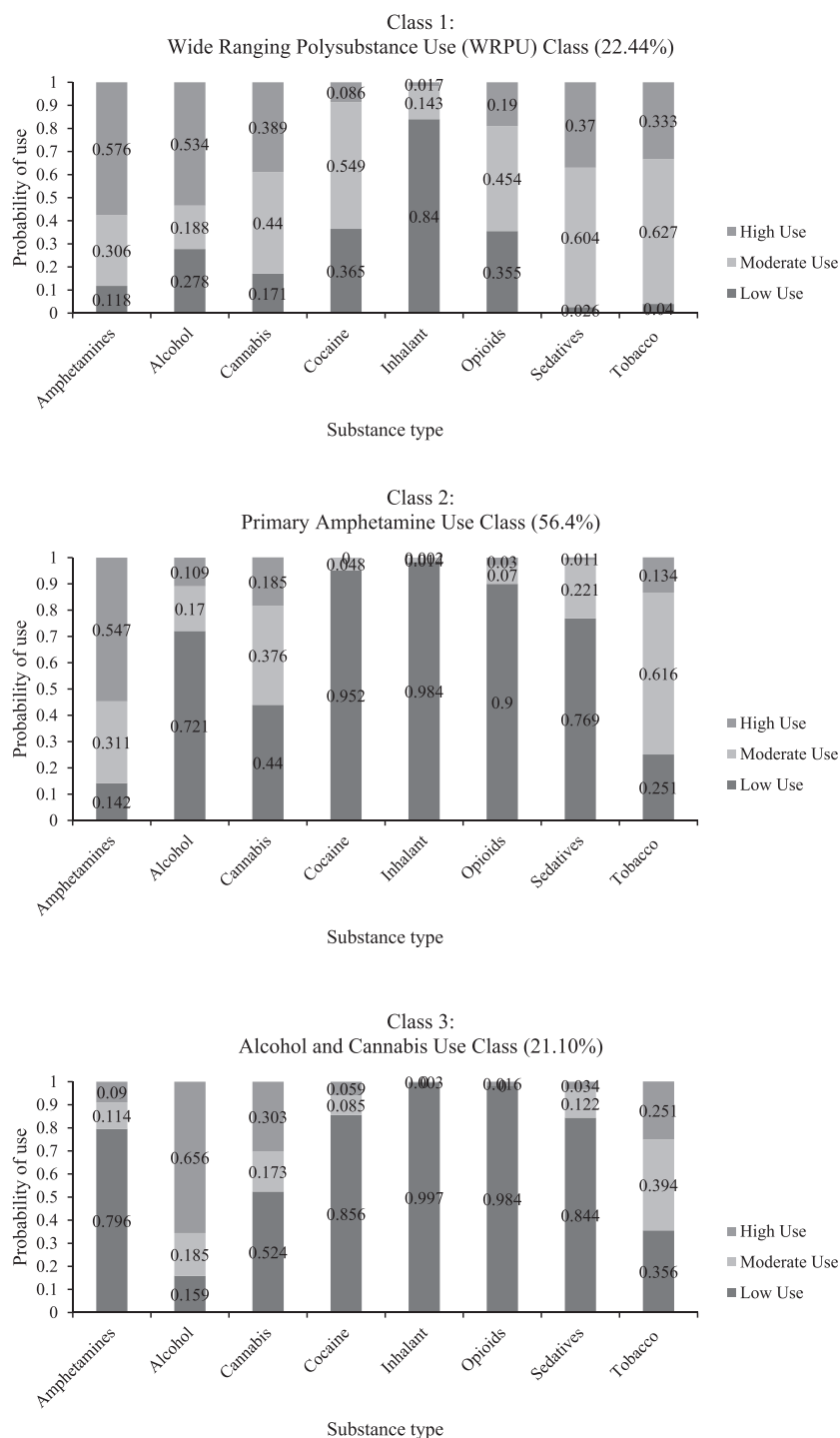


FIGURE 1 Probability of substance involvement by class from the three-class solution. Class 1 had high engagement with most drug types. Class 2 was characterized by predominant amphetamine use and class 3 used mainly alcohol and cannabis

amphetamine use class. This probably reflects the need for more intensive treatment in the WRPU group, due to the primacy of their wide-ranging use. Patients characterized by polysubstance use in outpatient settings report the least self-efficacy to maintain abstinence [14]. Previous research suggests that better substance use outcomes are achieved in residential settings providing integrated treatment for mental health comorbidities [61, 62]. On a service level, the WRPU class highlights the need to assess for and target the multiple morbidities that people present with using high-intensity, integrated

treatment [9, 10, 63]; for example, by including specialist-delivered interventions for a specific disorder (e.g. psychosis), as well as more broad, organizational approaches that facilitate recovery across multiple psychosocial domains. However, it is also important to consider that the prevalence of WRPU was small (22%).

Our final aim was to prospectively determine which substance use classes are more likely to complete treatment. Contrary to predictions, substance use class type did not predict treatment completion. Treatment completion is a known predictor of substance use recovery

TABLE 3 Class differences in sex, age, service enrolment type, treatment completion, mental health symptoms and quality of life (QoL)

Variable	Class 1: WRP (n = 167)	Class 2: Primary amphetamine users (n = 420)	Class 3: Alcohol and cannabis users (n = 157)
Demographics			
Sex, n % male	87 (52.09)	178 (42.38)	90 (57.32)
Age (mean, SD)	27.67 (4.59)	28.58 (3.94)	28.19 (4.72)
Residential programme (n, % residential)	135 (80.83)	266 (63.33)	119 (75.79)
Day programme treatment completion (n, %)	14 (43.75)	75 (48.70)	23 (60.52)
Residential treatment completion (n, %)	55 (40.74)	102 (38.35)	52 (43.69)
Mental health (mean, SD)			
Depression	16.68 (6.87)	12.48 (7.22)	14.46 (7.06)
Anxiety	14.08 (5.83)	10.29 (6.37)	11.49 (5.91)
Experienced or witnessed a traumatic event (n, %)	128 (76.64)	284 (43.80)	102 (64.96)
PTSD	3.96 (1.46)	3.46 (1.72)	3.43 (1.69)
Psychosis	1.85 (1.61)	1.38 (1.61)	1.07 (1.32)
QoL	3.56 (2.64)	4.96 (3.01)	4.47 (2.80)

PTSD, post-traumatic stress syndrome; SD, standard deviation; WRP, wide ranging polysubstance users.

TABLE 4 Multinomial logistic regression examining the association of mental health symptoms, service type and quality of life (QoL) with substance use class membership (n = 744)

Outcome class	Comparator class	Predictor	OR (95% CI)	SE	Z	P
Alcohol and cannabis use (n = 157)	Wide-ranging polysubstance use (n = 167)	Sex ^a	0.95 (0.60–1.51)	0.23	−0.21	0.830
		Age	0.98 (0.93–1.51)	0.03	−0.60	0.550
		Service type ^b	1.33 (0.77–1.04)	0.28	1.02	0.307
		QoL	0.96 (0.87–2.28)	0.05	−0.89	0.374
		Depression	0.98 (0.93–1.05)	0.03	−0.79	0.431
		Anxiety	1.04 (0.98–1.03)	0.03	1.41	0.158
		Psychosis	1.30 (1.11–1.11)	0.08	3.28	0.001*
		PTSD	1.10 (0.98–1.52)	0.06	1.69	0.092
Amphetamine use (n = 420)	Wide-ranging polysubstance use (n = 167)	Sex ^a	1.81 (1.22–2.67)	0.20	2.97	0.003
		Age	0.96 (0.92–1.00)	0.02	−1.93	0.054
		Service type ^b	2.35 (1.50–3.68)	0.23	3.72	0.000*
		QoL	0.96 (0.89–1.04)	0.04	−0.94	0.349
		Depression	1.03 (0.98–1.08)	0.02	1.24	0.214
		Anxiety	1.04 (0.99–1.10)	0.03	1.68	0.093
		Psychosis	1.07 (0.95–1.21)	0.06	1.09	0.275
		PTSD	1.09 (0.99–1.20)	0.05	1.68	0.092
Alcohol and cannabis use (n = 157)	Amphetamine use (n = 420)	Sex ^a	0.53 (0.36–0.78)	0.20	−3.23	0.001*
		Age	1.03 (0.98–1.07)	0.02	1.23	0.219
		Service type ^b	0.56 (0.37–0.86)	0.22	−2.65	0.008
		QoL	0.99 (0.92–1.08)	0.04	−0.12	0.904
		Depression	0.95 (0.91–1.00)	0.02	−2.15	0.031
		Anxiety	1.00 (0.95–1.05)	0.03	0.00	0.999
		Psychosis	1.21 (1.05–1.40)	0.07	2.7	0.007
		PTSD	1.01 (0.92–1.12)	0.05	0.29	0.773

CI, confidence interval; OR, odds ratio; PTSD, post-traumatic stress syndrome; SE, standard error.

*P < 0.002. Reference categories were males^a for sex and ^bresidential enrolments for service type. OR = odds ratio; CI = confidence interval; SE = standard error; PTSD = post-traumatic stress syndrome.

[64, 65], especially in residential treatment settings [6]. Completion rates below 50% were observed in our sample, regardless of whether the client was enrolled in a residential or day-treatment programme. This is consistent with previous research conducted among various substance use treatment settings, where treatment dropout rates have ranged from 40 to 59% [66–68]. Such retention rates highlight the need to continue refining treatment services to improve retention. As 18–35 years is a critical point of substance use intervention, focusing upon treatment retention in young people specifically is important for substance use prevention strategies. While some individuals may require lengthier and more intensive treatment, integrated and individualized treatment methods are also required more broadly to provide a solution to the treatment attrition rates observed in this and other studies. Currently, treatment provided by alcohol and other drug (AOD) services predominantly consists of counselling or assessment and education, which falls outside the evidence base for effectively treating comorbidities through evidence-based programmes such as cognitive behaviour therapy (CBT) (e.g. [69, 70]). Furthermore, previous research has shown that early attrition from substance use treatment is associated with the perceived importance of addressing emotional or psychological problems over problematic substance use [71]. This suggests that addressing mental health problems early in a client's admission may increase motivation to remain in substance use treatment.

Our study had several strengths and limitations. To the best of our knowledge, this is the first study that investigated substance use classes and their mental health associates among young people who are accessing residential and day-treatment. The study included a large sample of young people admitted to treatment for a broad range of substance use problems and used a comprehensive set of mental health measures. The age, sex and primary substance type of participants are consistent with national residential treatment data showing that 66% of clients are male, 61% are aged between 20 and 39 years and amphetamines, alcohol and cannabis are the most common substances for which people seek help [4]. This suggests that current findings are generalizable to young people aged 18–35 years accessing residential treatment programmes in Australia. However, the generalizability of results to day-programmes is unknown, as very little is known about the characteristics of people seeking this type of treatment. While the impact of class membership upon treatment completion was examined, we were unable to investigate whether class membership predicted treatment outcomes. However, the structure and content of the treatment programme delivered across and within the seven residential and four day substance-use services included in this study probably varied, and our results should be interpreted with caution due to small sample sizes in some services. Investigating treatment completion within services delivering more consistent treatment programmes would have provided more insights into which substance use classes were more likely to complete treatment. Our definition of treatment completion was limited by the data collected and may not reflect the client completing a full treatment programme or recovering fully from substance use. Longitudinal outcomes are warranted to further understanding treatment types and recovery.

CONCLUSIONS

Our study sheds light on the high levels of polysubstance use and co-occurring mental health problems among young people entering substance use treatment. People with wide-ranging polysubstance use may be more likely to experience additional clinical complexities than single substance users, including psychosis. Future research is required to increase the understanding of the patterns of polysubstance use and comorbid mental health problems that young people present with in treatment; and develop more integrated treatments targeted toward the multiple morbidities this population experiences.

ACKNOWLEDGEMENTS

This study was funded by the Australian Government Department of Health awarded to the National Centre for Youth Substance Use Research (NCYSUR) under the Drug and Alcohol Prevention Program. L.H. is supported by a National Health and Medical Research Council Senior Research Fellowship. The funding source had no involvement in the study design, collection, analysis and interpretation of data, or writing of the report. Open access publishing facilitated by The University of Queensland, as part of the Wiley - The University of Queensland agreement via the Council of Australian University Librarians. Open access publishing facilitated by The University of Queensland, as part of the Wiley - The University of Queensland agreement via the Council of Australian University Librarians.

DECLARATION OF INTERESTS

None to declare.

AUTHOR CONTRIBUTIONS

Valeriya Mefodeva: Conceptualization; data curation; formal analysis. **Molly Carlyle:** Formal analysis; methodology; supervision; validation. **Zoe Walter:** Validation. **Gary Chan:** Methodology; software; supervision. **Leanne Hides:** Conceptualization; methodology; resources; supervision.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Mefodeva V, Carlyle M, Walter Z, Chan G, Hides L. Polysubstance use in young people accessing residential and day-treatment services for substance use: substance use profiles, psychiatric comorbidity and treatment completion. *Addiction.* 2022;117(12):3110–20. <https://doi.org/10.1111/add.16008>