Demographics, Comorbidities, and Service Utilization Patterns of Clients Enrolled in Specialty Addiction Treatment for Amphetamine Use 2012-2018

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Proposal title/overview	
Demographics and Service Utilization Patterns of Clients Enrolled in Specialty Addiction Treatment for Amphetamine Use, 2012-2018	
Description of information	
A descriptive overview of demographics, comorbidities, and health service utilization of patients enrolling in AHS addiction services for crystal methamphetamine and amphetamine use over six years from 2012-2018.	
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Overview

Although recent addiction initiatives in Alberta have focused on opioids, stimulant use in the province is on the rise. The number of new clients in Alberta Health Service (AHS) addiction treatment services indicating that crystal methamphetamine and/or amphetamines are a substance of concern has more than doubled from just over 2,000 in 2012 to over 6,000 in 2017.

A high prevalence of drug users report polysubstance use (Olthuis, 2013, Kolajova, 2014). A survey of harm reduction clients in British Columbia found that over 70% reported polysubstance use (Kuo, Shamsian, Tzemis, & Buxton, 2014). Alberta's marginalized populations are at an increased risk of polysubstance use (Hyshka, Anderson, Wong, & Wild, 2016). Data has also shown that opioids are often used alongside stimulants.

The results of this study are intended to inform service planning, and substance use research in Alberta.

This report presents the results of secondary analyses of health service data for clients enrolling in AHS addiction services for methamphetamine and/or amphetamine use. Specifically, the report describes:

1. Temporal variation in enrollments over six fiscal years (2012/13 to 2017/18);
2. Regional (i.e., AHS operational geographic location) and sociodemographic (gender and age) variations in enrollments;
3. Prevalence of co-occurring substance use/concerns, i.e., patterns of comorbid opioid, alcohol, and cannabis use and concerns;
4. Prevalence of co-occurring lifetime diagnosed mental disorders and physical co-morbidities;
5. Comparisons of 1-4 above between clients enrolled in AHS addiction services with concerns about their methamphetamine and/or amphetamine use and clients not concerned about these substances

Method

Data sources

Clients were identified using the Addiction and Mental Health System for Information and Service Tracking (ASIST) database. ASIST is the clinical application used by addiction staff throughout the province and is the electronic health record for addiction services clients. ASIST

collects data on treatment, prevention, and information services provided and is entered by clinicians. These services include outpatient, residential, detox, and opioid dependency program services. Client-level information available includes demographics such as age, sex, education, and employment as well as information on substance use at time of enrollment to an addiction services.

To identify diagnosed comorbid mental health conditions and physical comorbidities, we used the Discharge Abstract Database (DAD), the National Ambulatory Care Reporting System (NACRS, since 2010), and the Practitioner Claims Database. These databases capture admissions to acute care facilities, visits to emergency departments, and physician billing claims, respectively. Trained professionals code the visits with ICD9/10 diagnostic codes; these were used to identify the comorbidities investigated in this report.

Client identification

Unique clients were identified and included for analyses based on their first enrollment in any AHS addiction service during a fiscal year. To account for clients who had more than one addiction treatment service episode (enrollment) in a given year, aggregate service utilization variables were created to capture the number and type of enrollments. This allowed us to identify which patients had more than a single addiction treatment service episode in a single fiscal year. We investigated six fiscal years' worth of data starting with 2012/13 and ending with 2017/18.

Upon enrollment in an addiction treatment service, substance use data is collected through the responses to the following two questions:

1. Have you used the substance 1 or more times in the past 12 months?
2. Have you been concerned about this substance use in the past 12 months?

For each question, clients respond either yes or no to a list of 17 substances, including: alcohol, non-beverage alcohol (Lysol), cannabis, cocaine, opiates, psychedelics, tranquilizers, antidepressants, barbiturates, amphetamines, crystal methamphetamines, inhalants, Talwin & Ritalin, androgens, smoking tobacco, and chewing tobacco.

To investigate how individuals concerned about their crystal methamphetamine and/or amphetamine use compare to individuals who are concerned with the use of other substances, clients were split into two cohorts.

- Amphetamine enrollments: clients who indicated that they were concerned about their crystal methamphetamine and/or amphetamine use (this could be in addition to any other substance they indicated they were concerned with).
- Other substance enrollments: all other clients who indicated that they were concerned about a substance other than crystal methamphetamine or amphetamines.

Data linkage

After identifying each cohort by index enrollment to a specialty addiction service, ASIST data were linked to acute care service use, inpatient service use, and practitioner claims datasets using unique lifetime identifiers (i.e., personal health numbers). These linked data sets were then used to describe service utilization patterns and mental and physical health comorbidities. The data quality section (see below) provides details on personal health number (PHN) linkage rates from ASIST.

To measure the burden of disease using administrative data we used comorbidity measurement tools developed by Charlson et al. (1987) and an ICD9/10 coding algorithm, specialized for administrative data, developed by Quan et al. (2005). The Charlson Comorbidity Index is a weighted measure for comorbidity burden that looks at 17 conditions:

> Myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic pulmonary disease, rheumatic disease, peptic ulcer disease, mild liver disease, diabetes without chronic complication, diabetes with chronic complication, hemiplegia or paraplegia, renal disease, any malignancy (including lymphoma and leukemia, except malignant neoplasm of skin), moderate or severe liver disease, metastatic solid tumor, HIV/AIDS.

Preliminary exploratory analysis of these 17 conditions indicated that liver disease and HIV/AIDS were the physical comorbidities with the highest prevalence (1-2%). The other 15 conditions all had a prevalence under 1% and were excluded from the analysis.

In addition to physical comorbidities, we investigated the following mental health or addiction-related problems as defined by the DSM-5:

> Substance-related and addiction disorders, mood disorders, anxiety disorders, schizophrenia, personality disorders, and other disorders not specified.

A client was considered to have a history of a comorbid condition if within the 24 months preceding the index enrollment for AHS addiction services they had:

- At least one hospital record with a corresponding ICD-10 code (i.e., liver disease, HIV/AIDS, substance, mood, anxiety, schizophrenia, personality, and/or other) OR;
- At least one emergency department record with a corresponding ICD-10 code, OR;
- At least three physician claims, within a single fiscal year, with a corresponding ICD-9 code.

To apply this to all six fiscal years, data from 2010/11 to 2017/18 were extracted for the comorbid case definitions. This was done to ensure that all index enrollments had records in the preceding 24 months.

Refer to Table 4 in Appendix A for a detailed description of ICD9/10 codes that were identified for defining comorbidities. While these comorbidity profiles indicate a history of a given condition, they may not be an accurate representation of current health status.

Statistical analyses

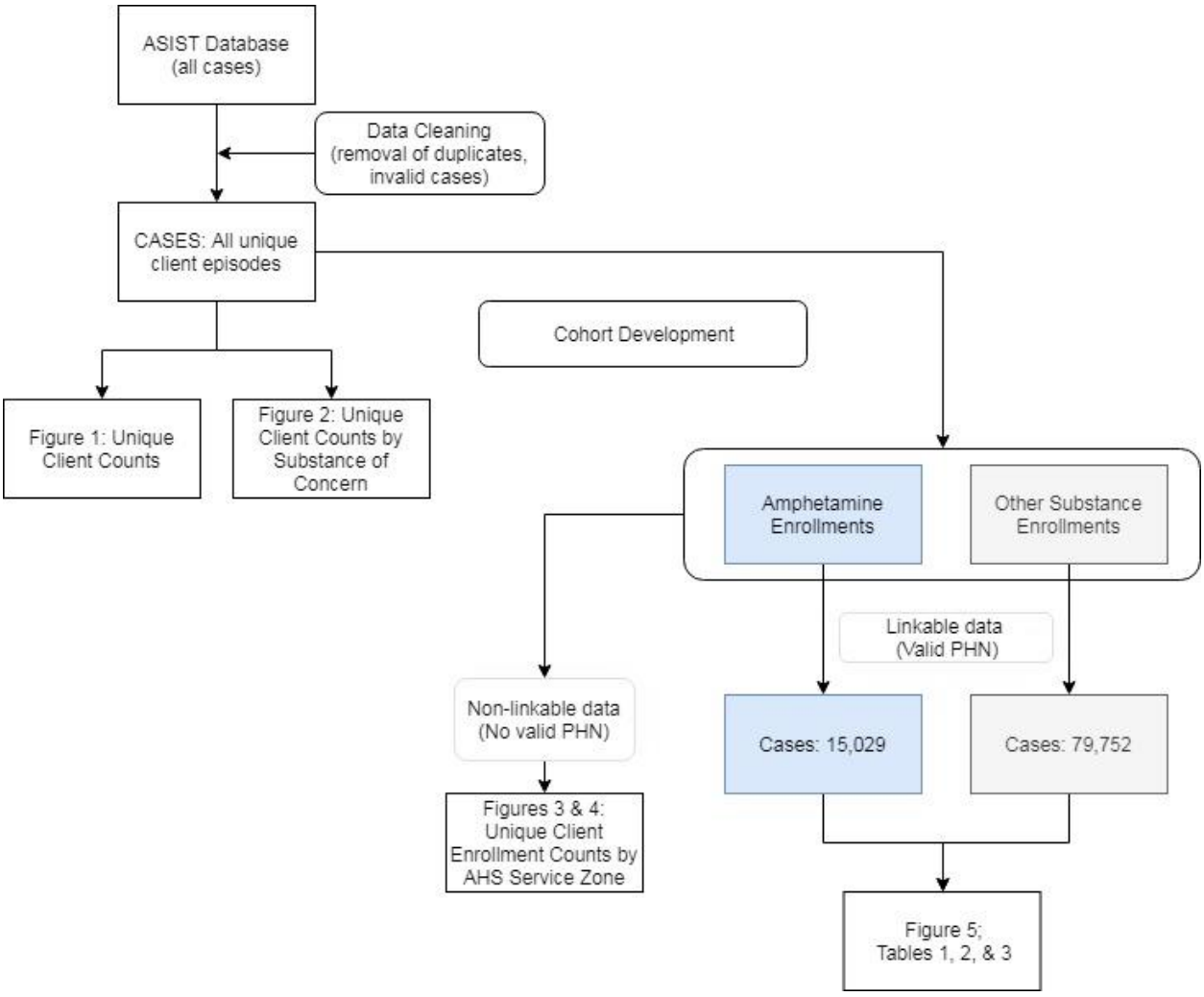
Statistical comparisons between amphetamine enrollments and other substance enrollments were conducted using SAS Enterprise Guide 7.1. Binary variables were presented as raw counts (*n*) and percentages. For continuous variables (i.e., age, all cause emergency department visits, all cause hospital visits, addiction service episodes, polysubstance use, polysubstance concern, and number of comorbid conditions), means and standard deviations are presented. Null hypothesis significance tests comparing amphetamine enrollments to other substance enrollments were not conducted because of the large number of number of clients under investigation. With 15,029 and 79,752 methamphetamine and other substance client enrolments from 2012 to 2018, respectively (see Figure 1), the study was able to detect an effect size of 0.03 or more with 80% power in a two-tailed test with alpha of 0.05 or less. This is equivalent of reliably explaining 0.05% of variance using regression, detecting a bivariate correlation as low as 0.02, or reliably observing a 1 to 5 percentage point difference in prevalence between these groups (Dennis et al., 1997). On this basis, null hypothesis significance tests were not required.

Data quality

Data quality notes for the ASIST database:

- 18% of enrollments in ASIST did not contain a valid numeric personal health number (PHN) and could not be linked for the comorbidity and health service analyses.
- The substance of concern question was missing for 14% of the enrollments in 2012/13, and rose to 29% of enrollments in 2017/18. In age and gender-stratified ancillary analyses, those with missing concern data were more likely to be female (18.2% of females are missing data compared to 14.4% males).
- In age and gender-stratified ancillary analyses, those with a missing PHN were younger (on average 3.4 years younger) and less likely to be female (19.6% of males were missing a valid PHN compared to 15.1% of females) when compared to clients with a valid PHN. In addition, amphetamine enrolments were less likely than other substance enrolments to exhibit non-linkable PHNs (11.2% of amphetamine enrolments were missing a valid PHN compared to 19.1% of other substance enrolments).

Figure 1. Cohort creation and analysis logic model.

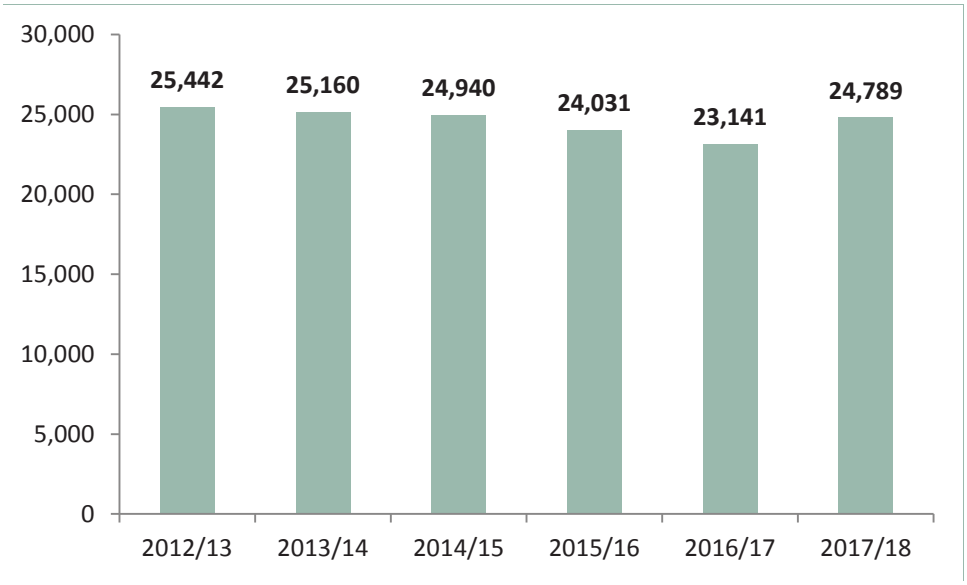


Results

Unique client counts by year

The number of clients enrolling in Alberta Health Services addiction treatment has been steady from 2012/13 to 2017/18 ranging from approximately 23,000 to 25,000 unique clients (Figure 1).

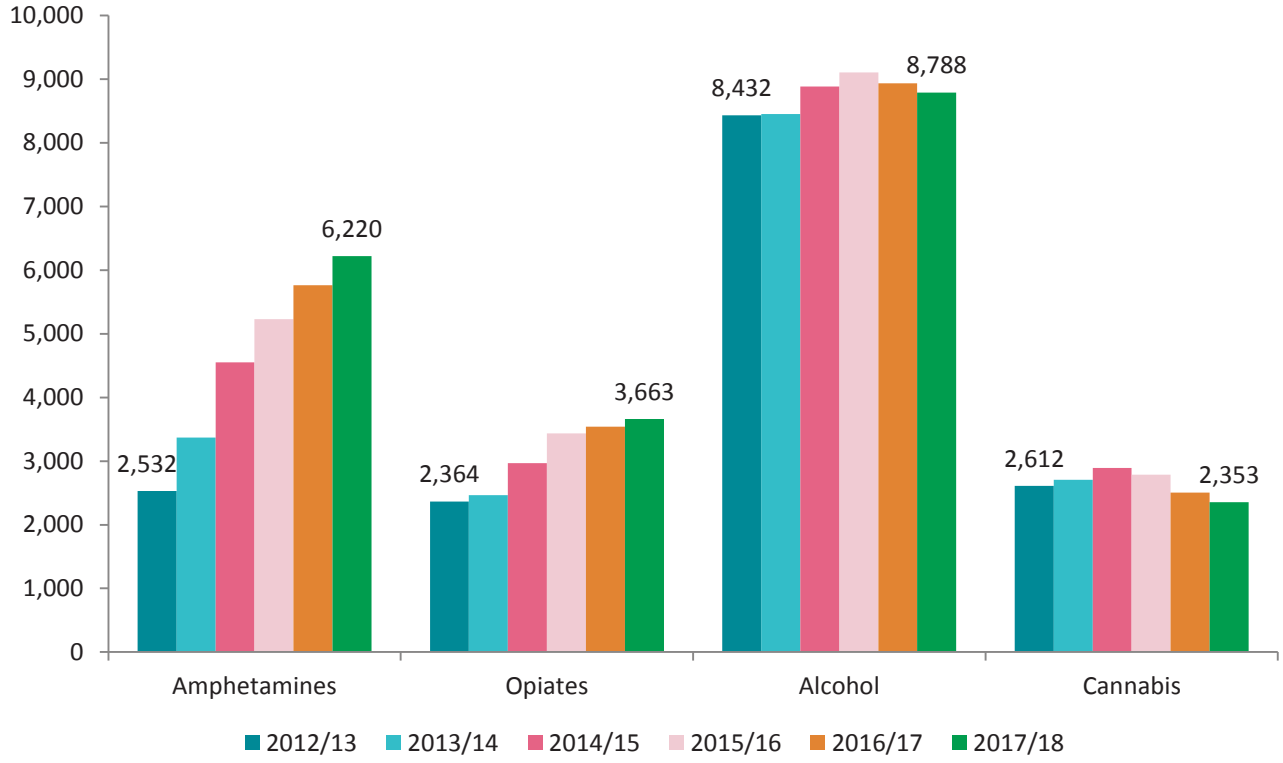
Figure 1. Count of Unique Clients with a New Addiction Service Enrollment, by Fiscal Year, Alberta (2012-13 to 2017-18)



Unique client counts by year and substances of concern

The number of clients concerned with their crystal methamphetamine and/or amphetamine use enrolling in AHS addiction services has more than doubled from 2012 to 2018 (Figure 2). In 2012/13, 10% of all new addiction treatment service enrollments indicated that crystal methamphetamines and/or amphetamines were a drug of concern, compared to 25% in 2017/18. There was also a 55% increase in clients concerned with their opiate use over the same period. In contrast, unique client enrollments for alcohol and cannabis remained steady from 2012 to 2018.

Figure 2. Unique Client Enrollment Counts by Substance Use, by Fiscal Year, Alberta (2012/13-2017/18)



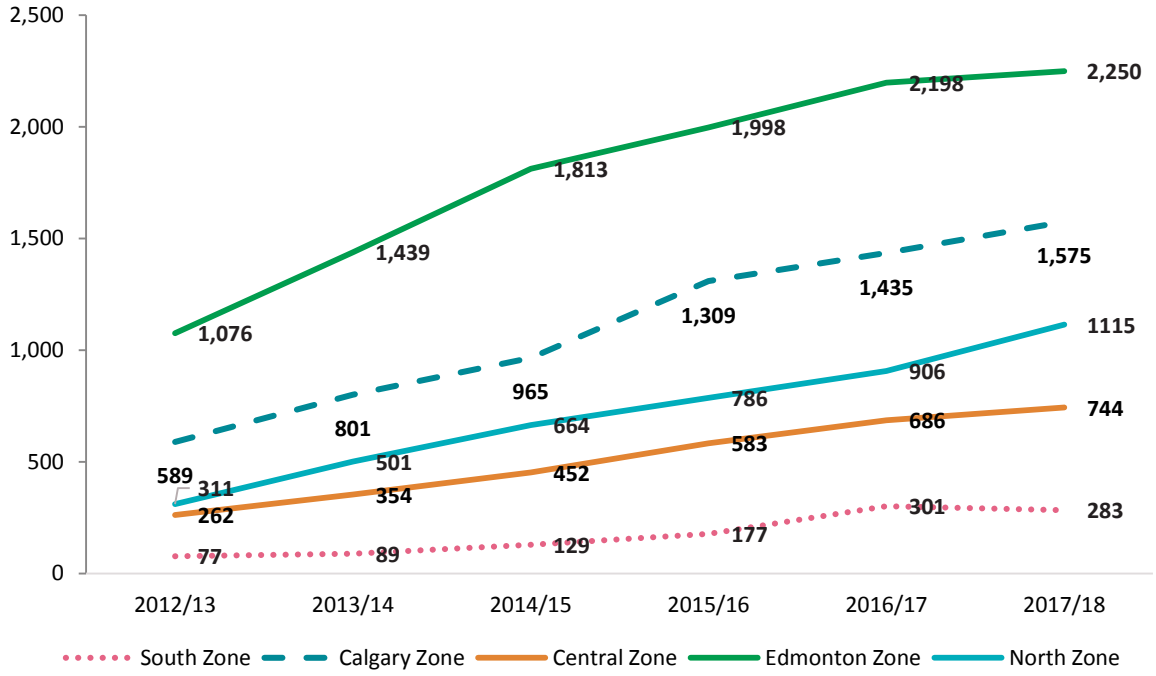
Note: Categories are not mutually exclusive (i.e., a client could be included in multiple categories).

Unique client counts by cohort, AHS geographic location and fiscal year

Both cases with personal health numbers and cases without personal health numbers were included in Figures 3 and 4.

The number of clients concerned with their crystal methamphetamine and/or amphetamine use has increased across all zones. Growth in amphetamine enrollments ranged from 109% in the Edmonton Zone to 268% in the South Zone. Edmonton and Calgary accounted for the majority of amphetamine related enrollments in Alberta during the study period.

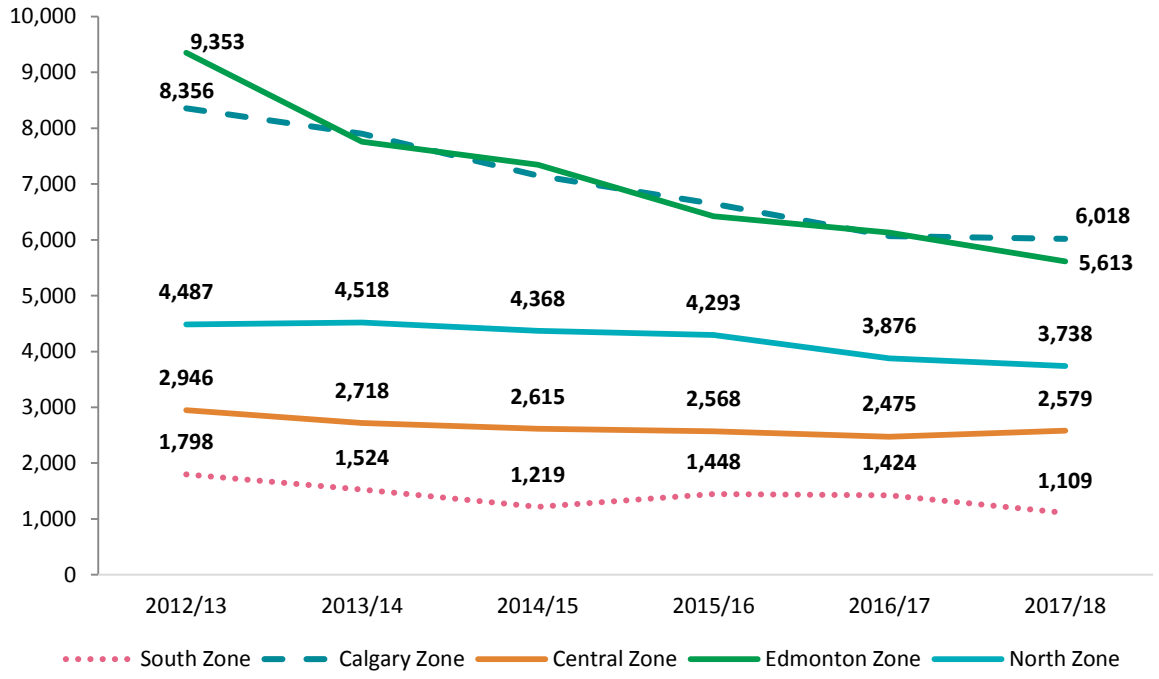
Figure 3. Amphetamine Enrollments: Unique Client Counts* by AHS Service Zone, 2012 – 2018.



Note: This cohort includes clients who were not linkable due to the absence of a valid PHN.

While the number of client enrollments concerned with amphetamines (cohort 1) increased across all zones, the number of client enrollments concerned with drugs other than amphetamines (cohort 2) decreased across all zones, with the Edmonton Zone showing the largest reduction (40%) and Central Zone having the smallest reduction (12%). Edmonton and Calgary accounted for the majority of other substance use enrollments in Alberta during this time period.

Figure 4. Other Substance Enrollments: Unique Client Counts* by AHS Service Zone, 2012 – 2018.



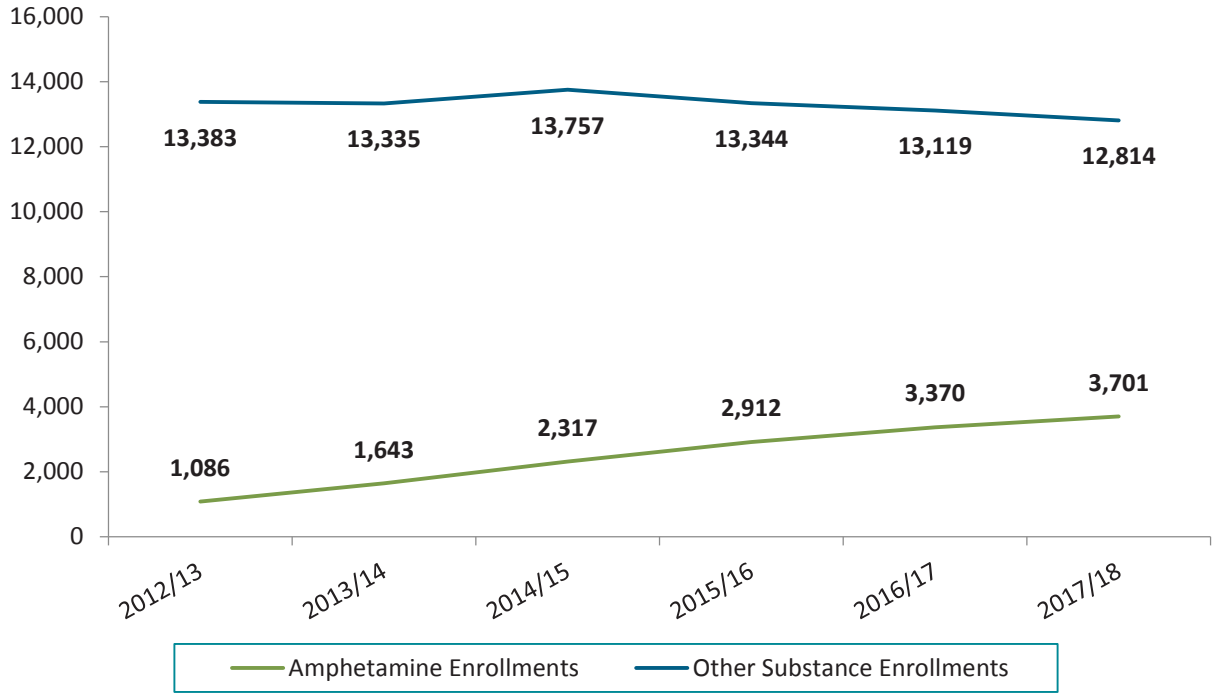
*Note: This cohort includes clients who were not linkable due to the absence of a valid PHN.

Unique client counts by cohort

Cases without a valid PHN were dropped from subsequent analyses because they could not be linked to other available administrative data sources. The remaining figure and tables reflect cases with a valid PHN only.

There was a 215% increase in the number of clients concerned with their crystal methamphetamine and/or amphetamine use from 2012/13 to 2017/18. In contrast, there were no changes in enrollment rates for clients concerned about other substances during the same period.

Figure 5. Unique Client Count by Cohort and Fiscal Year, Alberta 2012/13-2017/18



Demographic profiles, comorbidities, and health service utilization by cohort

A total of 15,029 linkable new enrollments (i.e., containing a valid PHN) reported concern with their amphetamine use from 2012 to 2018. A total of 79,752 linkable new enrollments reported concern with other substances, excluding amphetamines, over the same time period. These linkable enrollments were used to create the demographic and health service utilization profiles described below in Table 1, as well as the comorbidity profiles in Table 2 and the substances of use in Table 3.

Compared to clients enrolling in AHS addiction services for other substances, clients enrolling for amphetamine-related concerns were on average younger, more likely to be female, less likely to have completed high school, less likely to be employed in any capacity (full-time, part-time, or self-employed), and had more visits to the emergency department.

Table 1. Demographic Profiles and Health Service Utilization by Cohort, Alberta, 2012-2018

Variable	Amphetamine Enrollments (*n* = 15,029)	Other Substance Enrollments (*n* = 79,752)
Age, Mean (SD)	30.4 (9.2)	36.4 (13.5)
Female, *n* (%)	6,440 (42.9)	27,617 (34.6)
High School or Greater	5,766 (38.4)	41,691 (52.3)
Less than High School	7,734 (51.5)	30,026 (37.6)
Missing	1,529 (10.2)	8,035 (10.1)
Employed	3,333 (22.2)	32,873 (41.2)
Unemployed	10,533 (70.1)	40,356 (50.6)
Missing	1,163 (7.7)	6,523 (8.2)
Outpatient	11,045 (73.5)	61,618 (77.3)
Detox	5,273 (35.1)	20,918 (26.2)
Residential	1,865 (12.4)	9,109 (11.4)
Opioid Dependence Program	480 (3.2)	2,240 (2.8)
Emergency Department Visits	4.4 (7.9)	3.0 (6.1)
Hospital Visits	1.1 (2.9)	0.8 (2.3)
Addiction Service Episodes	1.5 (0.9)	1.3 (0.8)

* A single client could have multiple new enrollments of various service types within a single year.
** This is the average number of times a client visited an emergency department for any reason, was admitted as an inpatient for any reason, and the number of addiction treatment enrollments that occurred within the same fiscal year as the index enrollment to a specialty addiction treatment service. For example, a member of the amphetamine cohort had an average of 4.4 visits to an ED in the same fiscal year, compared to 3.0 visits by members of the other Substance cohort.

Comorbidity profiles by cohort

Amphetamine enrollments exhibited higher lifetime rates of mood, anxiety, and personality disorders, as well as higher rates of comorbid schizophrenia and other mental health conditions not specified, compared to clients enrolled with other substance concerns. On average,

amphetamine enrollments exhibited a higher number of comorbidities and more polysubstance use, compared to other substance enrollments (Table 2).

Table 2. Lifetime Comorbidity Profiles by Cohort, Alberta, 2012-2018

Variable	Amphetamine enrollments (*N*=15,029)	Other Substance enrollments (*N*=79,752)
Substance	10,942 (76.5)	44,828 (60.8)
Mood	7,154 (50.0)	29,384 (39.8)
Anxiety	6,216 (43.4)	25,490 (34.6)
Schizophrenia	2,946 (20.6)	6,978 (9.5)
Personality	2,845 (19.9)	8,023 (10.9)
Other	2,469 (17.3)	7,773 (10.5)
Developmental	2,237 (15.6)	5,563 (7.5)
Cognitive	628 (4.4)	3,199 (4.3)
Eating	160 (1.1)	706 (1.0)
Sex	94 (0.7)	300 (0.4)
Liver Disease	714 (5.0)	5,523 (7.5)
AIDS/HIV	137 (1.0)	263 (0.4)
Polysubstance Use**, Mean (SD)	6.3 (2.7)	3.7 (2.2)
Polysubstance Concern**, Mean (SD)	3.8 (2.4)	1.6 (1.4)
Number of Comorbid Conditions***, Mean (SD)	2.6 (2.0)	1.9 (1.8)

* Mental health conditions were categorized by diagnosis group according to the DSM5 and corresponding ICD codes. A single client could have multiple mental health conditions.
** The average number of substances a client, enrolling in an addiction treatment service, indicated was a substance of use or concern.
*** The average number of both physical and mental health conditions.

Substances of use and concern by cohort

Alcohol use and concern were greater amongst amphetamine enrollments, relative to clients enrolled for other substances of concern. Co-occurring tobacco, cannabis, and opiate use and concern were higher among amphetamine enrollments (Table 3).

Table 3. Substances of Use by Cohort, Alberta, 2012-2018

Variable	Amphetamine enrollments (*N*=15,029)	Other Substance enrollments (*N*=79,752)
Substance of Use, *n* (%)		
Alcohol	12,680 (*84.4*)	69,185 (*86.8*)
Tobacco, Smoking	12,412 (*82.6*)	55,335 (*69.4*)
Cannabis	10,650 (*70.9*)	39,245 (*49.2*)
Opiates	8,227 (*54.7*)	22,740 (*28.5*)
Alcohol	7,219 (*48.0*)	43,967 (*55.1*)
Tobacco, Smoking	6,745 (*44.9*)	24,653 (*30.9*)
Cannabis	4,004 (*26.6*)	11,407 (*14.3*)
Opiates	5,423 (*36.1*)	12,182 (*15.3*)

Notes

Substance of Use: A client enrolling in an addiction treatment service has indicated that they have used a substance in the last 12 months.

Substance of Concern: A client enrolling in an addiction treatment service has indicated that they were concerned with their use of a substance within the last 12 months.

Health service utilization was broken down into three parts:

1. Emergency department visits, this data was collected by aggregating the number of times a study participant appeared in the National Ambulatory Care Reporting System (NACRS) database within each fiscal year.
2. Hospital inpatient visits, this data was collected by aggregating the number of times a study participant appeared in the Discharge Abstract Database (DAD) within each fiscal year.
3. Addiction service treatment enrollments, this data was collected by aggregating the number of unique enrollments a study participant had within each fiscal year in ASIST.

The study participants were identified from the ASIST database and then linked to other administrative data for analysis. Please note the data limitations of ASIST in the data quality notes section.

ASIST was the only source used for identifying clients accessing addiction services. This report does not reflect any addiction services that are not offered by AHS.

Data sources

(1) AHS Administrative Data Repository (DRRX):

- Discharge Abstract Database (DAD)
- National Ambulatory Care Reporting System (NACRS, since 2010)
- Practitioner Claims Database
- Addiction and Mental Health System for Information and Service Tracking (ASIST)

Appendix 1: Databases & ICD Codes

Addiction and Mental Health System for Information and Service Tracking (ASIST) is the clinical application used by addiction staff throughout the province and is one of the electronic health records for addiction services clients. Information collected on different information systems in some zones were not included in the results. ASIST collects data for treatment, prevention, and information services provided and entered by clinicians. (https://insite.albertahealthservices.ca/amh/Page8525.aspx)

Discharge Abstract Database (DAD) which captures admissions to acute care facilities including dates, a primary diagnosis, and up to 24 secondary diagnoses coded using the Canadian Enhancement of the International Statistical Classification of Diseases, 10th Revision (ICD-10). Trained professionals code diagnosis codes and record data elements according to national guidelines set forth by the Canadian Institute for Health Information (https://www.cihi.ca/en/discharge-abstract-database-metadata).

Practitioner Claims Database, which records physician billing claims and up to 3 diagnosis codes, coded using the International Statistical Classification of Diseases, 9th Revision (ICD-9). This data is collected primarily to facilitate payment to physicians by the provincial government but is commonly used for health research studies.

National Ambulatory Care Reporting System (NACRS, since 2010) and *Alberta Ambulatory Care Reporting System* (AACRS, before 2010), which include visits to emergency departments including relevant dates, a primary diagnosis, and up to 9 secondary diagnoses coded using ICD-10. Diagnosis codes are coded by trained professionals using national guidelines, and data elements are recorded according to national guidelines set forth by the Canadian Institute for Health Information (https://www.cihi.ca/en/national-ambulatory-care-reporting-system-metadata).

Table 4. ICD-9/10 Coding Algorithms for Comorbid Condition Case Definitions

Comorbidities	ICD-10	ICD-9
Liver Disease	B18.x, K70.0–K70.3, K70.9, K71.3–K71.5, K71.7, K73.x, K74.x, K76.0, K76.2–K76.4, K76.8, K76.9, Z94.4, I85.0, I85.9, I86.4, I98.2, K70.4, K71.1, K72.1, K72.9, K76.5, K76.6, K76.7	070.22, 070.23, 070.32, 070.33, 070.44, 070.54, 070.6, 070.9, 570.x, 571.x, 573.3, 573.4, 573.8, 573.9, V42.7, 456.0–456.2, 572.2–572.8
AIDS/HIV	B20.x–B22.x, B24.x	042.x–044.x
Substance	F10-F19, F55	291.0–291.9, 292.0–292.9, 303.0–303.9, 304.0–304.9, 305.0–305.9
Mood	F30, F31, F34.0, F32, F33, F34.1, F38.1, F34.8, F34.9, F38.0, F38.8, F39	296.0–296.1, 296.4–296.8, 296.2, 296.3, 300.4, 311, 296.9
Anxiety	F40, F41, F42, F93.0–F93.2, F43.0, F43.1, F43.8, F43.9	300.0, 300.2, 300.3, 309.8, 308.3
Schizophrenia	F20–F29	295.0–295.9, 298.8, 298.9, 297.1–297.3, 297.0–297.3, 297.8–297.9, 298.0–298.4
Personality	F60, F61, F62, F68, F69	301.0–301.9
Other	F44, F45, F48, F53, F54, F59, F99, G21, G24, G25, T50.9, T74.0-T74.2, Z00.4, Z04.6	300, 3001, 30011, 30013, 30014, 30015, 30016, 30019, 3007, 30070, 30081, 30082, 3009, 30090, 306, 3069, 307, 30789, 3100, 31000, 3101, 31010, 3102, 3108, 3109, 313, 316, 7999
Developmental	F80-F84, F88-F90, F94, F95, F98	299, 2990, 29900, 29901, 2991, 29911, 2998, 29980, 29981, 2999, 29990, 29991, 307, 3070, 30723, 3076, 30921, 3120, 31200, 31220, 3128, 31281, 31289, 3129, 31290, 313, 31381, 31389, 31400, 31401, 3149, 315, 31500, 3152, 31531, 3159, 31590, 317, 31700, 318, 3180, 31800, 3181, 31810, 319, 31900

Cognitive	F00-F07, F09, G30	290, 2900, 29000, 2901, 29010, 29013, 2902, 29020, 29021, 2903, 29030, 2904, 29040, 29041, 29042, 29043, 2908, 2909, 293, 2930, 29300, 2931, 29389, 2939, 294, 2940, 29400, 2941, 29410, 2948, 29480, 2949, 78009
Eating	F50, F98.2, F98.3	307.1, 307.50, 307.51, 307.54
Sex	F52, F64, F65, F66	302.0–302.9

References

Charlson, M. E., Pompei, P., Ales, K. L., & MacKenzie, C. R. (1987). A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of Chronic Diseases, 40*, 373–383.

Dennis, M.L., Lennox, R.D., & Foss, M.A. (1997). Practical power analysis for substance abuse health services research. In K.J. Bryant, M. Windle, & S.G. West (eds.), The science of prevention: Methodological advances from alcohol and substance abuse research. Washington, DC. American Psychological Association Press (pp. 367-404).

Hyshka, E., Anderson, J., Wong, Z., & Wild, T. C. (2016). Risk Behaviours and Service Needs of Marginalized People Who Use Drugs in Edmonton's Inner City: Results from the Edmonton Drug Use and Health Survey. Retrieved from https://crismprairies.ca/wp-content/uploads/2017/02/Edmonton-Drug-Use-and-Health-Survey-Dr.-Elaine-Hyshka-January-2016.pdf

Kolajova, M., Fulton, H. G., Darredeau, C., & Barrett, S. P. (2014). Substance use patterns associated with injection drug use initiation in a low-threshold methadone-maintained sample. *Journal of Substance Use, 19*(6), 436-439. https://doi.org/10.3109/14659891.2013.856476

Kuo, M., Shamsian, A., Tzemis, D., & Buxton, J. A. (2014). A drug use survey among clients of harm reduction sites across British Columbia, Canada, 2012. *Harm Reduction Journal, 11*(1), 13-13. https://doi.org/10.1186/1477-7517-11-13

Olthuis, J. V., Darredeau, C., & Barrett, S. P. (2013). Substance use initiation: The role of simultaneous polysubstance use. *Drug and Alcohol Review, 32*(1), 67-71. https://doi.org/10.1111/j.1465-3362.2012.00470.x

Quan, H., Sundararajan, V., Halfon, P., Fong, A., Burnand, B., Luthi, J., . . . Ghali, W. A. (2005). Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical Care, 43*(11), 1130-1139. https://doi.org/10.1097/01.mlr.0000182534.19832.83