BRITISH COLUMBIA
CENTRE ON
SUBSTANCE USE
Networking researchers, educators & care providers

Trends in drug checking results across British Columbia

January to December 2022

Land Acknowledgement

The BC Centre on Substance Use would like to respectfully acknowledge that the land on which we work is the unceded ancestral homelands of the xwmekwey'em (Musqueam), Skwxwú7mesh (Squamish), and sel'ílweta| (Tsleil-Waututh) Nations.

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Learn more about www.drugcheckingbc.ca

For further drug checking-related inquiries,
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Purpose of the Report

This report is written to provide an overview of the substances checked at community drug checking sites across British Columbia (BC) in 2022. The data have been analyzed by health authority region and by drug category in order to examine any trends in the unregulated drug supply that may be region, or category-dependent. The drug categories used were: opioids, depressants, stimulants, psychedelics, other, polysubstance, and unknown.

Additionally, specific compounds such as benzodiazepines, xylazine, para-fluorofentanyl, and fentanyl were highlighted in the analysis to better understand the changes in adulteration of the drug supply throughout the year.

The data were collected at drug checking access sites that use a Fourier-transform infrared (FTIR) spectrometer in combination with fentanyl and benzodiazepine immunoassay strips.

Community Drug Checking Organizations

Listed below are a list of the organizations that offered drug checking services in community sites in the 2022 calendar year and the data in this report includes drug checking results collected at those locations.

ANKORS

ASK Wellness

Fraser Health Authority

Get Your Drugs Tested

Interior Health Authority

Island Health Authority

Mountainside Harm Reduction Society

Northern Health Authority

Portland Hotel Society

POUNDS Project

Progressive Housing

Purpose Society

RainCity Housing

Sources Community Resources Society

University of British Columbia-Okanagan

Vancouver Coastal Health Authority

List of Acronyms and Other Frequently Used Terms

BC: British Columbia

Buffs: Inert compounds that are added to the final product to increase size or bulk

Cuts: Psychoactive or pharmacologically active compounds that mimic or enhance the effects of the intended drug in the substance

Unregulated Opioids: Term used in the data analysis to refer to samples expected to contain opioids and are categorized as fentanyl, heroin, fentanyl and heroin, and/or "down", unless otherwise noted

"Down": Colloquial term used for drugs expected to contain an unknown opioid, with fentanyl or heroin most commonly expected. In this report, "down" is a category of unregulated opioids used to capture those samples purchased or obtained as "down" rather than a specific expected opioid.

DTES: Vancouver's Downtown Eastside neighbourhood

Expected drugs: An individual's expectation of what the drug is prior to drug check

FTIR: Fourier-transform Infrared spectrometer

GC/MS: Gas Chromatography/Mass Spectrometry

LC/MS: Liquid Chromatography/Mass Spectrometry

OPS: Overdose Prevention Site

qNMR: quantitative Nuclear Magnetic Resonance

SCS: Supervised Consumption Site

Tables and Figures

Summary of Key Findings

- A total of 22,096 samples were checked in 2022, with September having the most samples checked in one month
- The number of samples checked in 2022 is a 363% increase from the first full year of drug checking services in 2018
- The number of drug checking access points increased by 11 new locations across BC in 2022, with a peak of 32 drug checking locations in July 2022
- Opioids were the most checked category, with a total of 8,604 samples, and the most common opioid checked was “down” (4,514 total samples)
- All of the drug categories increased in the number of samples checked across the year compared to data collected in 2021, with the exception of depressants (decreased from 1,038 to 996 samples)
- Stimulants matched expectation in 94.9% of samples and was the drug category with the greatest proportion of concordance between the reported expected substance and the drug checking results
- Fentanyl concentration increased in areas outside DTES from 9.4% to 14.3% compared to an increase in the DTES from 13.4% to 15.3%.
- Benzodiazepines, para-fluorofentanyl, and xylazine all increased in prevalence in unregulated opioid samples throughout the year
- Etizolam was detected in 180 samples by the FTIR spectrometer and was the most detected benzodiazepine in 2022.
- The type of benzodiazepines detected by the FTIR spectrometer changed to predominantly bromazolam from etizolam starting in October through December
- Samples expected to be alprazolam were the most frequently checked substance in the depressant category, with 483 total samples in 2022, and matched expectation in 56.7% of samples
- There were 2,425 expected-cocaine samples submitted in 2022, making it the most checked substance in the stimulant category
- MDMA was the most checked psychedelic throughout the year and had a total of 2,575 expected-MDMA samples submitted for checking in 2022

Background and Methods

Since March 2020, communities in British Columbia (BC) continued to be impacted by both the ongoing overdose crisis and the COVID-19 pandemic. Harm reduction services such as supervised consumption sites (SCS), overdose prevention sites (OPS) and drug checking were introduced in response to the toxic drug crisis and public health emergency declared in April 2016, and continued to be offered at community sites throughout 2022. During the early stages of the pandemic, many harm reduction services had to close or reduce capacity to accommodate the COVID-19 restrictions. In response, drug checking services found ways to adapt, such as offering drop-off options, to maintain access to the harm reduction service. The results from drug checking can provide harm reduction information to the people accessing the service, and can also provide valuable insight into the unregulated drug supply in BC.

The data presented in this report are drug checking samples collected between January 1, 2022 through December 31, 2022 from community drug checking sites across British Columbia, using the Fourier-transform infrared (FTIR) spectrometer in combination with both benzodiazepine and fentanyl immunoassay strips. The FTIR spectrometer is a device used at community drug checking sites that can determine the composition of a substance by shining infrared light at a sample and examining the resulting absorption spectrum.[1] Each compound has a unique absorption spectrum, which can be compared to drug reference libraries in order to identify up to six of the compounds present in a sample through a subtractive analysis. The technique is a non-destructive method, meaning that the sample can be returned to the individual after analysis is complete. While the FTIR is a cost- and time-effective method for checking substances, it has been found to have a detection threshold of 5-10%, which means that compounds must have a greater than 5-10% concentration in the sample in order to be consistently detected.[2]

Benzodiazepine and fentanyl immunoassay strips were both originally designed for use with urine samples, but have been validated for use in drug checking settings with non-urine samples.[2] The immunoassay strips detect the presence of the compound at a higher sensitivity compared to the FTIR spectrometer through selective antibodies that are reactive to the target compound, either fentanyl or benzodiazepines.[1,2,3] They can provide binary information about whether fentanyl or benzodiazepines are present in a sample, and have been found to also detect some analogues, but they do not quantify the concentration of the compound in the sample. Both the FTIR spectrometer and immunoassay strips together can provide drug checking results with both sensitivity and specificity to the compounds present in a sample.

Both fixed and 'pop-up' drug checking sites were included in the analysis. Drug checking at large multi-day music festivals (Bass Coast and Shambhala) were excluded, but pop-up drug checking services at smaller music festivals, such as Altitude, Wicked Woods, FVDED in the Park and Electric Love, were included. Data from the Bass Coast and Shambhala music festivals are available at https://drugchecking.ca/2022-festival-infographic/. Mail-in samples were also excluded from analysis, as their origin can often not be confirmed. Data collected at the drug checking sites were organized by regional health authority: Vancouver Coastal Health (VCH), Fraser Health (FH), Interior Health (IH), Vancouver Island Health (VIH), and Northern Health (NH). Of note, data from VIH in this report includes only one location that operates an FTIR spectrometer-based service. However, the University of Victoria drug checking project, Substance, reports on data from other communities across the VIH region separately. These data are not included in this report as Substance uses different technologies and at this time the data are not harmonized for reporting purposes. For more information on the UVic Substance drug checking project, visit https://substance.uvic.ca. Regions were further categorized as the Vancouver Downtown Eastside (DTES) neighbourhood in the Vancouver Coastal Health region and elsewhere in BC, which included FH, IH, VIH and NH regions. The data were analyzed in two ways: 1) by looking at both health authority region, and 2) by drug categories in order to determine any trends that may be region or substance-specific. For example, fentanyl concentration was analyzed by region to better understand how it may differ between the Vancouver DTES neighbourhood and elsewhere in BC.

Substances were also analyzed by drug category in order to determine trends within specific substance types. Categories were separated as opioids, depressants, stimulants, psychedelics, polysubstance, other, and unknown. Substances in the polysubstance category are samples that have multiple active drugs present, unknown were samples where the person accessing the service didn't know what the substance was prior to the substance being checked, and the other category were samples that did not fit into any drug class. The unregulated opioids category was defined as samples that were expected to contain any opioid that could not be further specified (i.e., fentanyl, heroin, fentanyl and heroin, and/or "down"). It is of note that "down" is a colloquial term used to refer to substances that contain unknown opioids, and will be referred to as "down" in this report. Adulteration of, and changes to, the unregulated opioid supply were examined by the prevalence of select compounds–xylazine, benzodiazepines, and para-fluorofentanyl–each month to gain insight into any trends across the year. Each drug category was also analyzed by examining what compounds were detected by the FTIR spectrometer for the main substances in each drug category.

In order to determine concordance of substance expectation, the data in each drug category were analyzed by comparing what the person accessing the service expected the substance to be with the drug checking results. Both fentanyl and benzodiazepines were determined to be present or absent with a positive immunoassay strip, through identification with the FTIR spectrometer, or both. The concentration of fentanyl in samples was determined retrospectively using the Bruker Quantitative Analysis 2 (QUANT 2).[4,5] Fentanyl concentrations of samples were examined by month and by region in order to determine any trends in the province throughout the year.

For more information about drug checking services in the province, visit www.drugcheckingbc.ca. The drug checking data collected from 2018 to present is also publicly available and can be viewed in an interactive overview at https://drugcheckingbc.ca/dashboard/.

Results

Drug Checking Utilization

In 2022, there were a total of 22,096 samples submitted for drug checking at sites across British Columbia. The number of samples checked per month consistently increased across the year, with 1,181 samples checked in January compared to 1,973 samples checked in December (see **Figure 1**). September had the highest number of samples checked across the year, with a total of 2,202 samples. One explanation for the peak in September is the occurrence of smaller music festivals during that time and an increase in drug checking service access through pop-up locations at the festivals. The relatively low number of samples in January were a continuation of a dip in December 2021 (1171 samples), which could be due to services being disrupted over winter holidays.

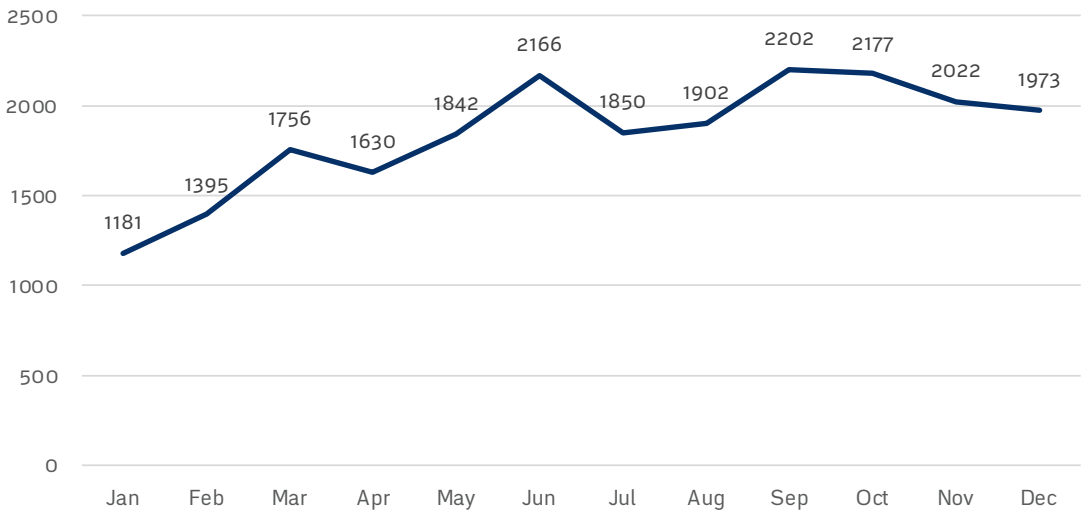

Figure 1. *Total number of samples checked each month in 2022 across BC.*

Since the inception of drug checking services in 2017, the number of samples checked each year has grown exponentially (see **Figure 2**). The first full year of drug checking was in 2018 and had a total of 4,771 samples. The number of samples continued to increase each year through to 2022, with 22,096 samples checked in the year, or a 363% increase since 2018. Several factors can contribute to the exponential increase, including an increase in the number of sites available in the community and the awareness of the service as it continues to expand across the province.

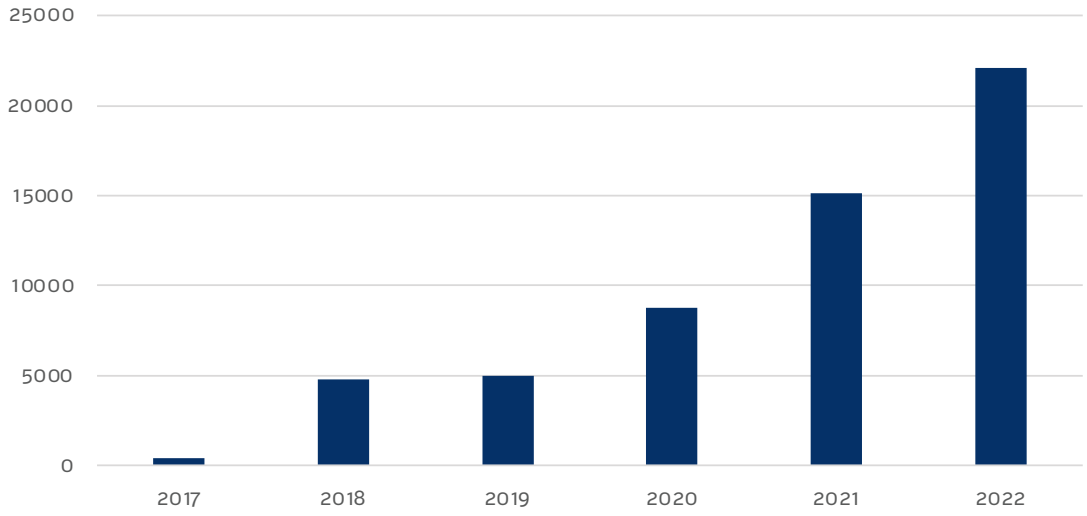

Figure 2. *Bar graph of the total number of samples checked each year from 2018 through 2022 in BC*

Opioids were consistently the most frequently checked drug category throughout the year, with May (897 samples) and June (895 samples) having the greatest number of opioid samples checked by month (see **Figure 3**). Psychedelics and stimulants were the next two most frequently checked drug categories in 2022. The psychedelic category had the greatest number of samples checked in September (621 samples), which could be a result of smaller music festivals occurring during that month. The stimulant category also had the greatest number of samples checked in September with 440 samples. The polysubstance category remained significantly lower than other categories throughout the year.

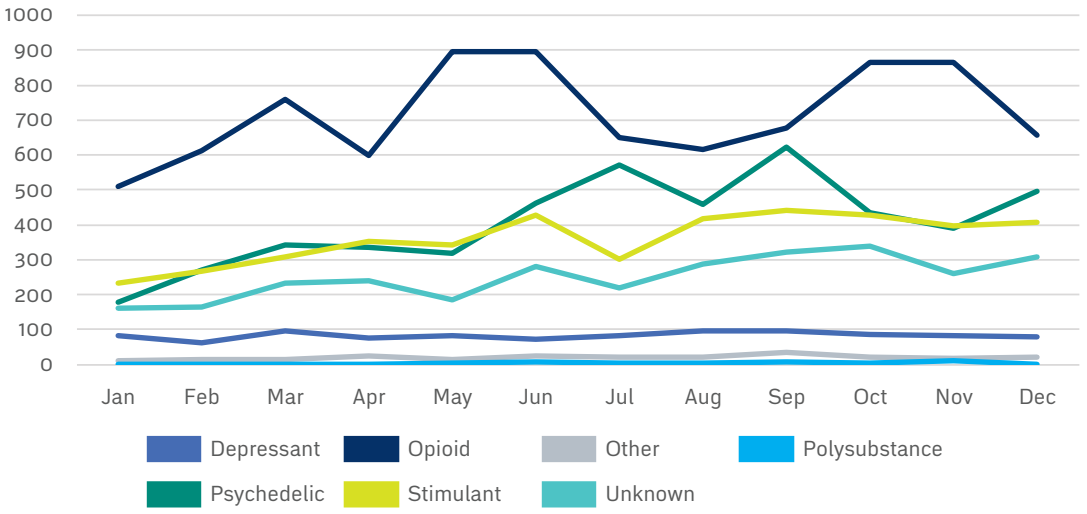

Figure 3. *Total number of samples checked in each category across BC each month in 2022*

When comparing the 2021 to the 2022 drug checking data, the opioid category remained the most frequently checked category for both years and had a 43.3% increase in the number of samples checked in 2022 (see **Figure 4**). The only category that had a decrease in the number of samples submitted in 2022 compared to 2021 was the depressant category, with a 4.0% decrease in 2022.

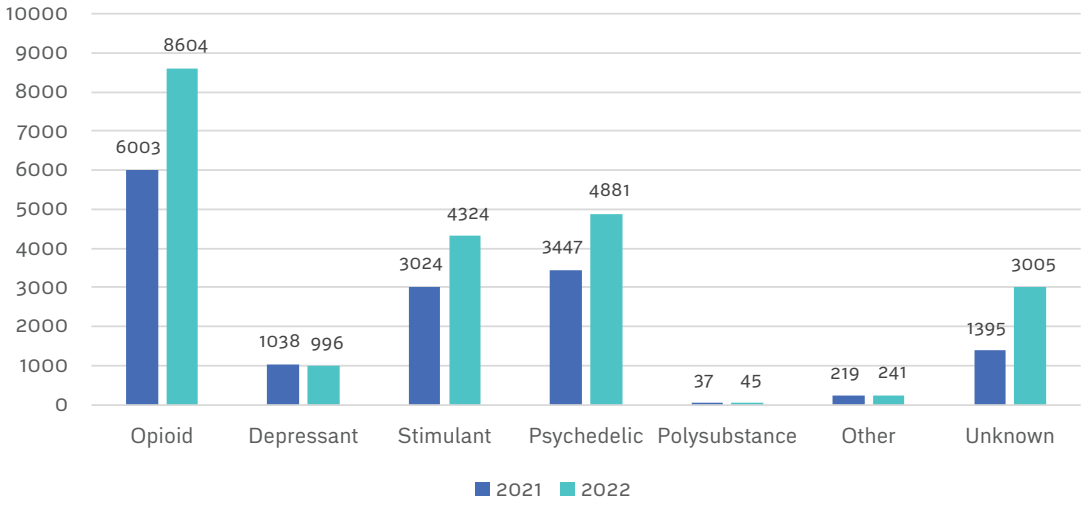

Figure 4. *Comparison between 2021 and 2022 drug checking data of number of samples checked by substance category*

When comparing the total samples checked between health authority regions, the Vancouver Coastal Health region consistently checked the greatest number of samples each month, with a peak in June of 1,625 samples checked (see **Figure 5**). One explanation is that the drug checking sites in the VCH region are predominantly located within the densely populated Vancouver downtown core, which could impact the number of individuals accessing the service in that region and lead to high volumes at each site. In particular, Get Your Drugs Tested (GYDT) is located in the Vancouver DTES neighbourhood and provides drug checking services 7 days a week for 8 hours a day and with two FTIR spectrometers at all times, making drug checking services highly accessible in the area. The Interior Health region had the next highest number of samples checked per month across the year and had a peak in September, with 465 samples checked, corresponding to the pop-up drug checking sites available at smaller music festivals available in the region during that time. Of note, drug checking services were officially offered for the first time at community sites in the Northern Health region starting in April 2022, explaining why no samples were checked in the first few months of 2022.

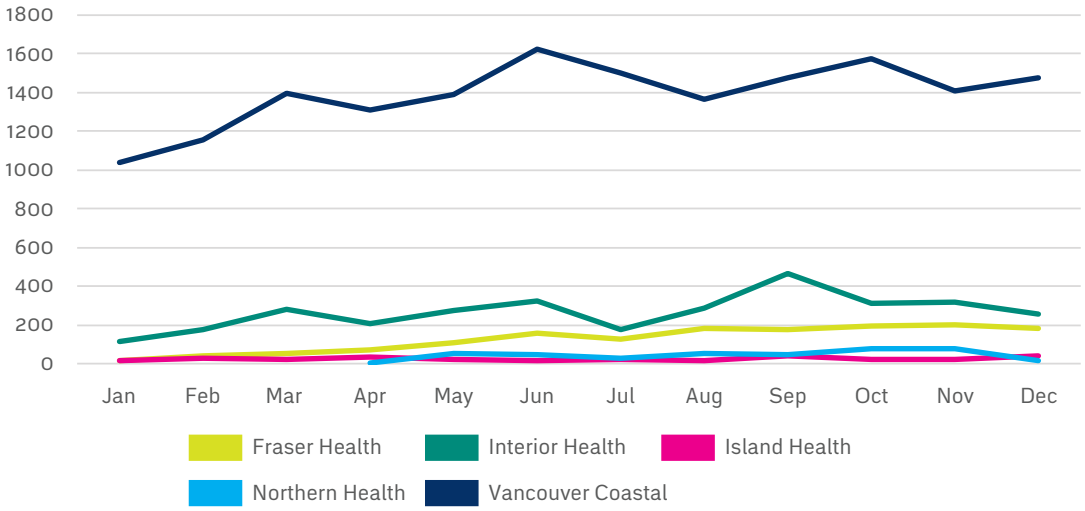

Figure 5. *Total number of samples checked in each health authority per month*

Drug checking services expanded by a total of 11 drug checking sites throughout 2022, from 20 sites in January, to 31 sites available in December (see **Figure** 6). Sites shown in the data include permanent locations in the community, as well as pop-up services offered at small music festival such as Altitude, Wicked Woods, FVDED in the Park and Electric Love. Drug checking services offered at the Bass Coast and Shambhala music festivals were not included in the **Figure 6** data. The Interior Health region consistently had the greatest number of drug checking access points in 2022, ranging between 13 to 18 sites. The Fraser Health region had an increase of five drug checking service locations, which could be attributed to The Mountainside Harm Reduction Society beginning to offer drug checking services at various community locations in the Fraser Health region in July 2022. Additionally, the Northern Health region implemented drug checking services in the community starting in April 2022, increasing the total number of sites available in BC.

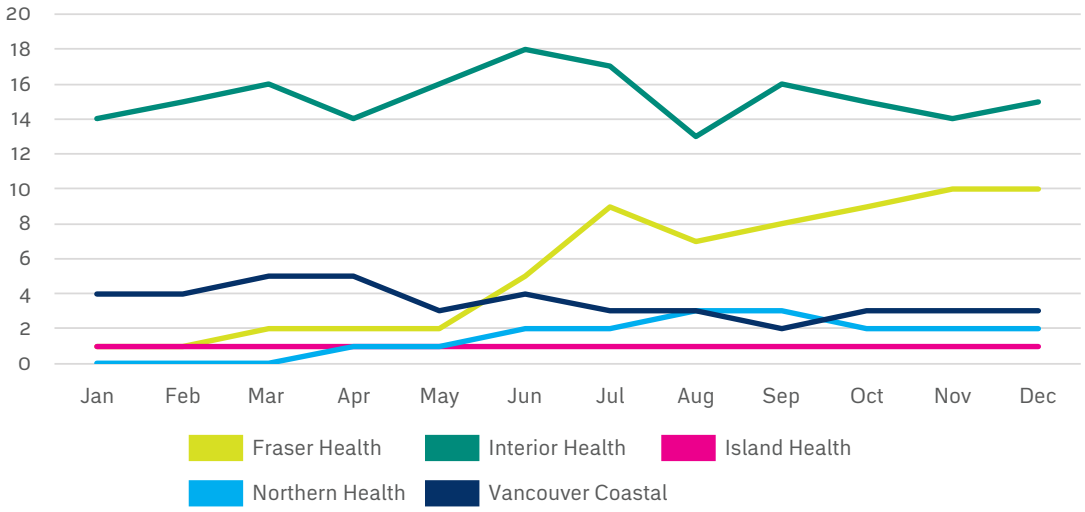

Figure 6. *Total number of community drug checking access points by health authority region each month*

Drugs Meeting Expectations

When accessing drug checking services, people are asked what they expect the substance to be, which can be used to determine concordance of expectations compared to the checking results. Samples are considered concordant if the main expected substance is present, based on the FTIR or immunoassay strip result. Other active and unexpected compounds may be present in the sample, but are not used to determine sample concordance. In 2022, stimulants met expectations in the greatest percentage of samples (94.9% meeting expectation), while drugs in the "other" category had the least concordance, with 57.3% of samples meeting expectations (see **Figure 7**). Polysubstance samples, referring to samples submitted for checking that contain multiple substances from different drug categories, matched expectation in 75.6% of samples. A sample is labelled as an N/A result when the individual compounds are unable to be confidently identified, potentially due to the active compound being present in a complicated mixture, the compound is not available in the reference library, or the individual refuses the use of an immunoassay strip.

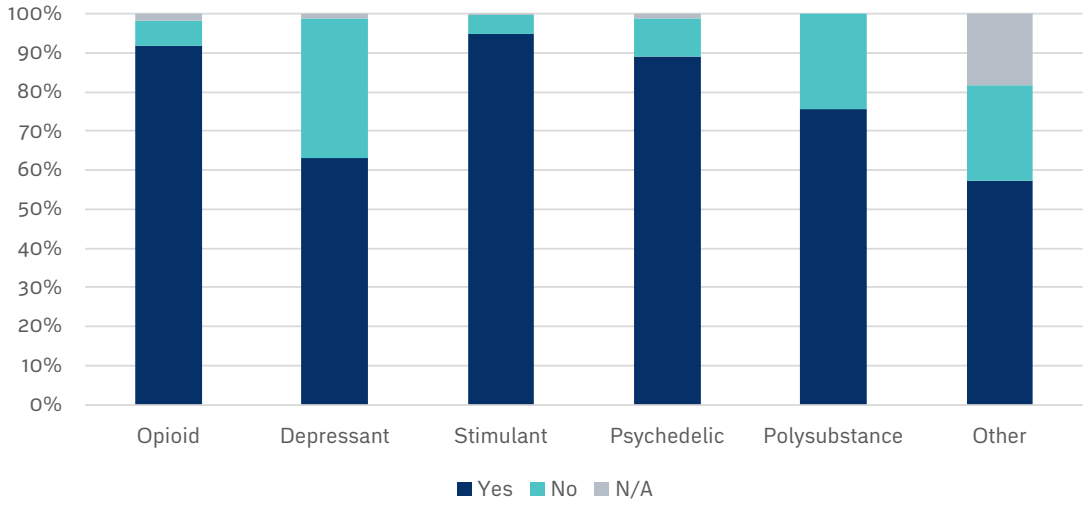

Figure 7. *Stacked barplot of expectation to drug checking result concordance by percentage in each category in 2022*

Opioids

In 2022, there were a total of 8,604 samples (38.9% of all samples) checked in the opioid category. “Down” was consistently the most submitted type of opioid to drug checking each month, with January having the least number of samples (266 samples), and a peak in October of 500 samples (see **Figure 8**). Fentanyl was the next most submitted opioid, also showing the fewest samples submitted in January (170 samples), while May had the greatest number of fentanyl samples submitted (399 samples). January had the least number of samples submitted in all categories (see **Figure 1**), which could explain why it was the month with the fewest number of “down” and fentanyl samples submitted to drug checking in 2022.

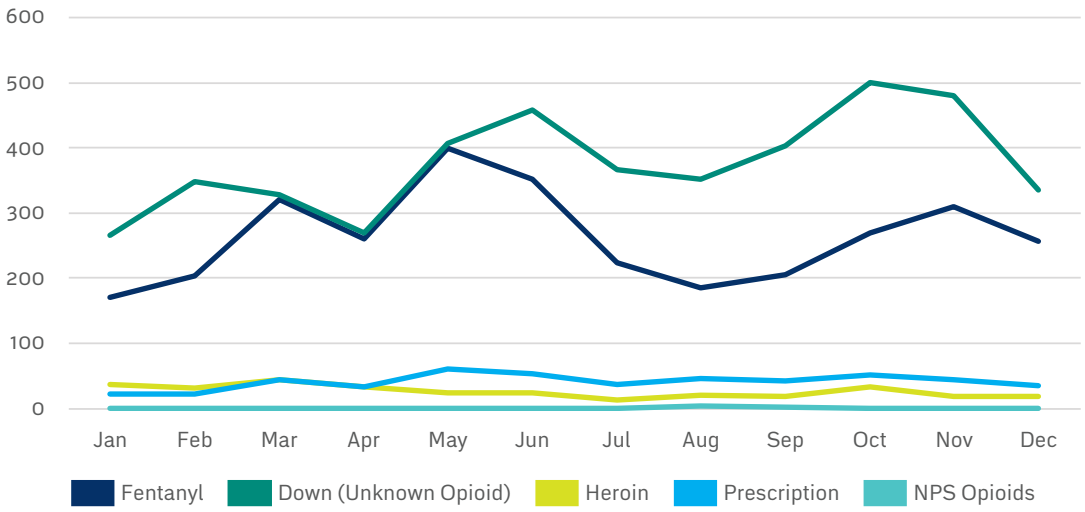

Figure 8. *Line graph of the total opioid samples by type checked per month across BC in 2022*

Fentanyl Concentrations

Over the year, the fentanyl concentration of samples checked at sites in the Vancouver DTES increased from 13.4% in January to 15.3% in December (see **Figure 9**). Fentanyl concentration of opioid samples checked at community sites elsewhere in BC also saw an increase across the year, from 9.4% in January to 14.3% in December. There was a peak in fentanyl concentration in both the Vancouver DTES (17.3%) and elsewhere in BC (15.1%) in September.

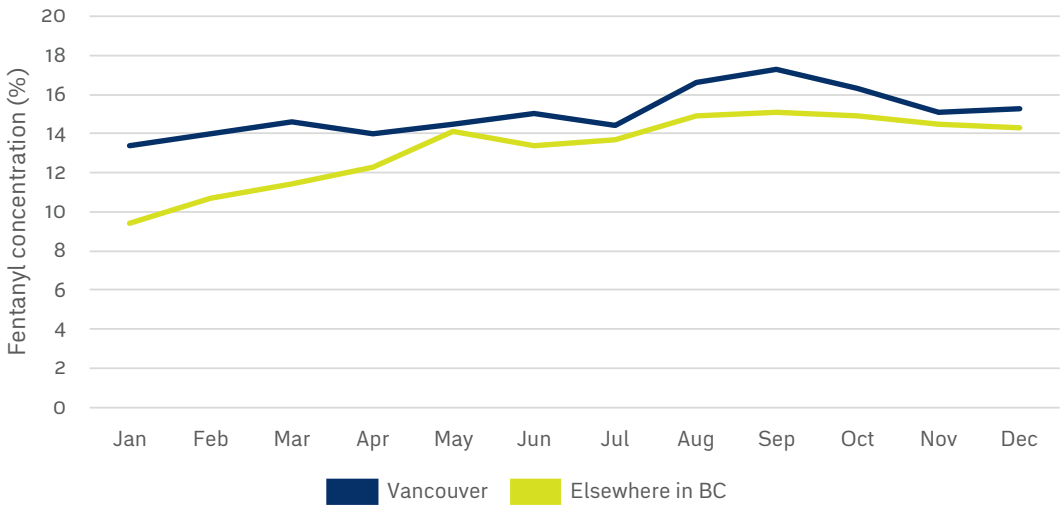

Figure 9. *Comparison of fentanyl concentration per month between sites in Vancouver DTES and sites elsewhere in BC*

Expected-Fentanyl Samples

A total of 3,154 expected-fentanyl samples were submitted for drug checking and 3,034 (96.2%) were confirmed to contain fentanyl, with either a fentanyl immunoassay strip or by the FTIR spectrometer. Other compounds in the sample were determined using the FTIR spectrometer. When looking at what other compounds were in the concordant samples, fentanyl was identified by the FTIR spectrometer in 1,744 samples (57.5%) (see **Figure 10**). Due to the detection threshold of the FTIR spectrometer, some samples may be confirmed as fentanyl-positive with the test strip only, which is why not all 3,034 samples were identified to contain fentanyl when looking specifically at the compounds identified by the FTIR spectrometer. The two most frequently detected buffs were caffeine in 2,533 samples (83.5%) and erythritol in 1,704 samples (56.2%). In the remaining samples (less than 2%), instances of a wide variety of other compounds were detected and are listed below **Figure 10**. While these compounds were not commonly found

in most samples, the variation of different compounds is important to note, as it highlights the unpredictability and toxicity of the unregulated opioid supply.

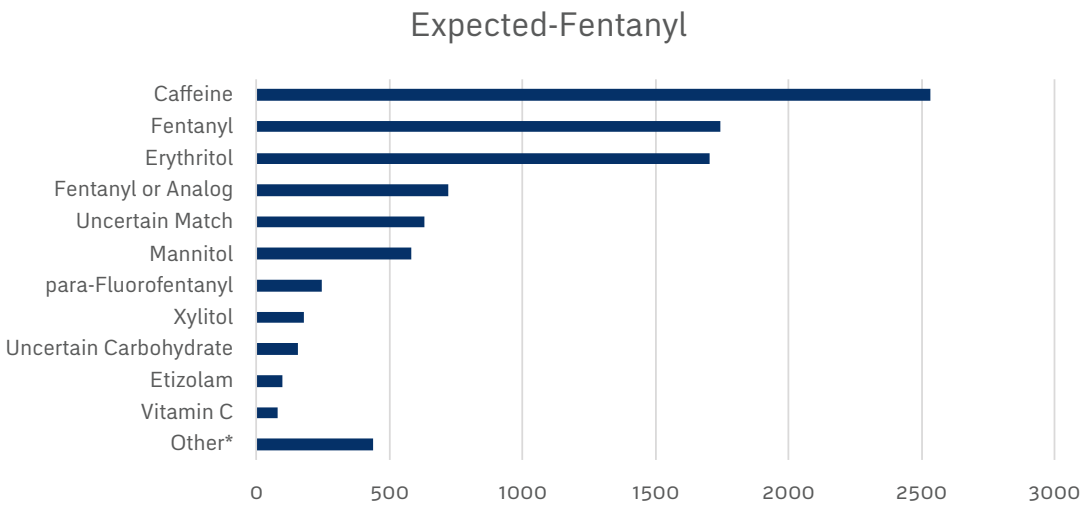

Figure 10. *Bar graph of the most common substances found in expectation-concordant fentanyl samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <2% of expected-fentanyl samples include: xylazine, methamphetamine, sucrose, heroin HCl, bromazolam, propionanilide, uncertain oil, phenacetin, dimethyl sulfone, flualprazolam, inositol, amphetamine, lactose, diphenhydramine, desalkylgidazepam, 4-ANPP, glucose, acetoacetanilide, No Library Match, sorbitol, 4-Anilino-1-Boc-piperidine, alprazolam, acetaminophen, AMB-FUBINACA, carfentanil, flubromazepam, metonitazene, microcrystalline cellulose, benzocaine, cocaine base, polyethylene glycol, uncertain mineral, 1-Boc-4-(4-fluoro-phenylamino)-piperidine, calcium carbonate, cannabidiol, cocaine HCl, diclazepam, heroin base, lidocaine, piperidine, piperidone, plaster, 4-anilinopiperidine, 6-MAM, deschloroetizolam, diazepam, etodesnitazene, flubromazolam, furanyl UF-17, GHB, glutamine, isotonitazene, MDMA, nimetazepam, nitrazepam, propylene glycol, talc, uncertain salt*

Expected-Heroin Samples

Expected-heroin samples were confirmed to contain heroin in 210 samples of the total 317 (66.2%) samples submitted for drug checking. Of the expectation-concordant heroin samples, the three most common compounds in the sample were heroin in 202 samples (96.2%), caffeine in 97 samples (46.2%), and 6-MAM in 40 samples (19.0%) (see **Figure 11**). 6-monoacetylmorphine (6-MAM) is a closely related compound to heroin, which could impact the detection of heroin by the FTIR spectrometer and could be a cause for heroin not being confirmed to be in 100%

of expectation-concordant samples. Fentanyl was also present in 14 (6.7%) of the expected-heroin samples, which is of note due to fentanyl having a higher potency than heroin and can increase the risk of overdose.[6] Additionally, six expected-heroin samples (2.9%) were found to contain an unspecified fentanyl analogue, captured here as "Fentanyl or Analogue".

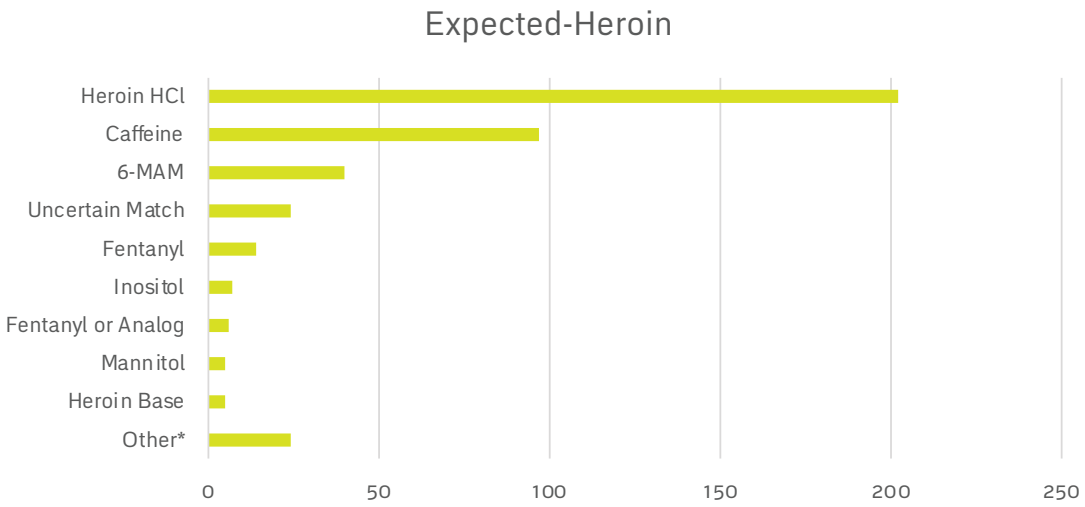

Figure 11. *Bar graph of the most common substances found in expectation-concordant heroin samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <1% of expected-heroin samples include: lactose, noscapine, para-fluorofentanyl, acetaminophen, dimethyl sulfone, erythritol, uncertain carbohydrate, cocaine base, cocaine HCl, MDMA, methamphetamine, sucrose, vitamin C, xylitol*

Expected-"Down" Samples

A total of 4,514 expected-"down" samples were submitted for drug checking in 2022. A total of 4,351 (96.4%) samples were confirmed to contain an opioid, as confirmed by an immunoassay strip or the FTIR spectrometer. It is important to note that "down" is a colloquial term for substances expected to contain unknown opioids, typically fentanyl or heroin, so these results can be considered alongside the fentanyl samples above (**Figure 10**)**.** Of those 4,351 samples, caffeine (3,848 samples; 88.4%) and erythritol (2,766 samples; 63.6%), both buffs, were the two most common compounds (see **Figure 12**). The most detected active compound found in "down" samples was fentanyl (2,440 samples; 56.1%). Similar to the data shown in **Figure 10**, fentanyl may not be detected by the FTIR spectrometer in all samples if it's present in a low concentration, but may still be determined to be fentanyl-positive by a fentanyl immunoassay strip.

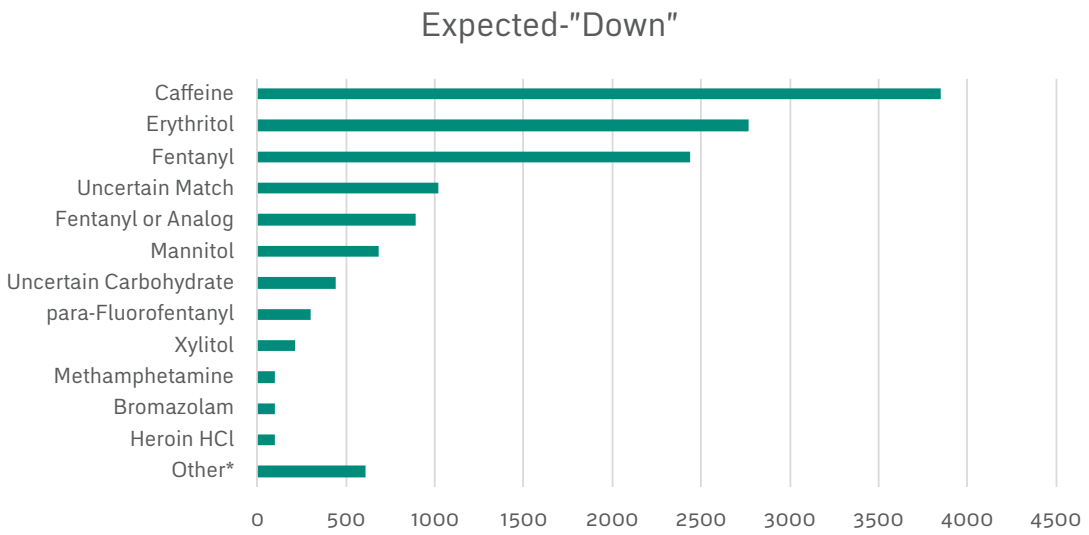

Figure 12. *Bar graph of the most common substances found in expectation-concordant "down" samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <2% of "down" samples include: etizolam, xylazine, sucrose, uncertain oil, desalkylgidazepam, dimethyl sulfone, inositol, propionanilide, flualprazolam, phenacetin, No Library Match, 6-MAM, Vitamin C, lactose, acetoacetanilide, glucose, cocaine base, polyethylene glycol, diphenhydramine, noscapine, acetaminophen, flubromazepam, metonitazene, 4-ANPP, alprazolam, MDMA, uncertain mineral, benzocaine, caffeine citrate, deschloroetizolam, dicalcium phosphate, W-19, 1-Boc-4-(4-fluoro-phenylamino)-piperidine, boric acid, heroin base, isopropylbenzylamine, piperidone, sodium bicarbonate, THC, uncertain salt, 4-Anilino-1-Boc-piperidine, carfentanil, citric acid, clonazolam, cocaine HCl, diclazepam, flubromazolam, gabapentin, glutamine, hydromorphone, isotonitazene, ketamine base, lorazepam, microcrystalline cellulose, morphine, plaster, pregabalin, procaine, propylene glycol, protonitazene, sildenafil, sorbitol, talc, taurine, uncertain wax*

Emerging Compounds in the Unregulated Opioids Supply

There were a few compounds that were increasingly detected throughout 2022 in the unregulated opioids supply, which is referring to samples that were expected to contain fentanyl, heroin, fentanyl and heroin, or "down". Xylazine, a veterinary tranquilizer, increased from being detected in 4 samples (0.8%) in January to 20 samples (3.3%) in December (see **Figure 13**).[7] While the prevalence of xylazine is relatively low compared to para-fluorofentanyl (see **Figure 14**) and benzodiazepines (see **Figure 15**) in the unregulated opioids supply, it's a trend that will continue to be monitored throughout 2023.

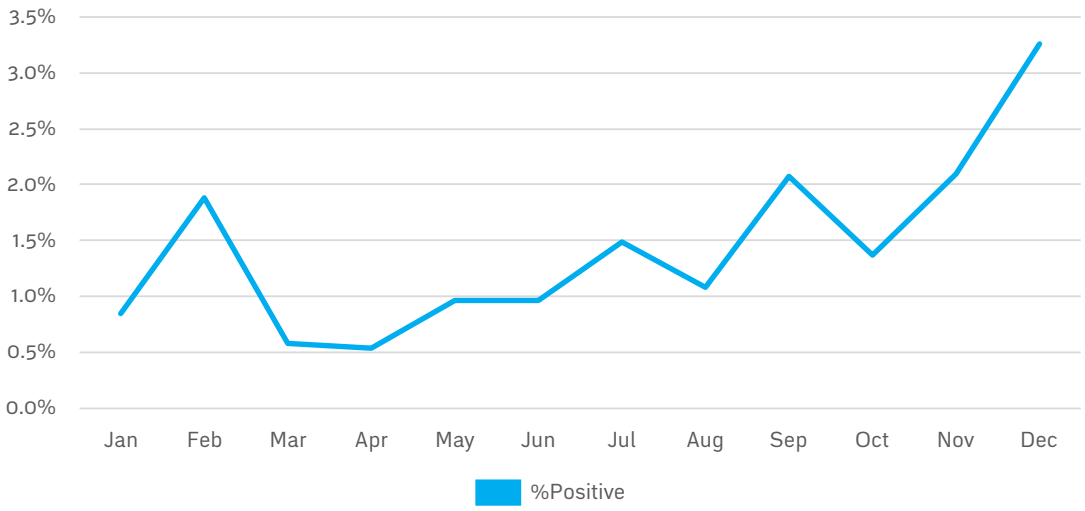

Figure 13. *Line graph showing the percentage of unregulated opioids samples that contained xylazine each month in 2022*

Para-fluorofentanyl is also becoming prevalent in the unregulated opioid supply, in addition to xylazine, increasing from 11 para-fluorofentanyl-positive samples (2.3%) in January to 122 samples (19.9%) in December (see **Figure 14**). Para-fluorofentanyl is a synthetic fentanyl analogue and is estimated to have a slightly lower potency compared to fentanyl.[8]

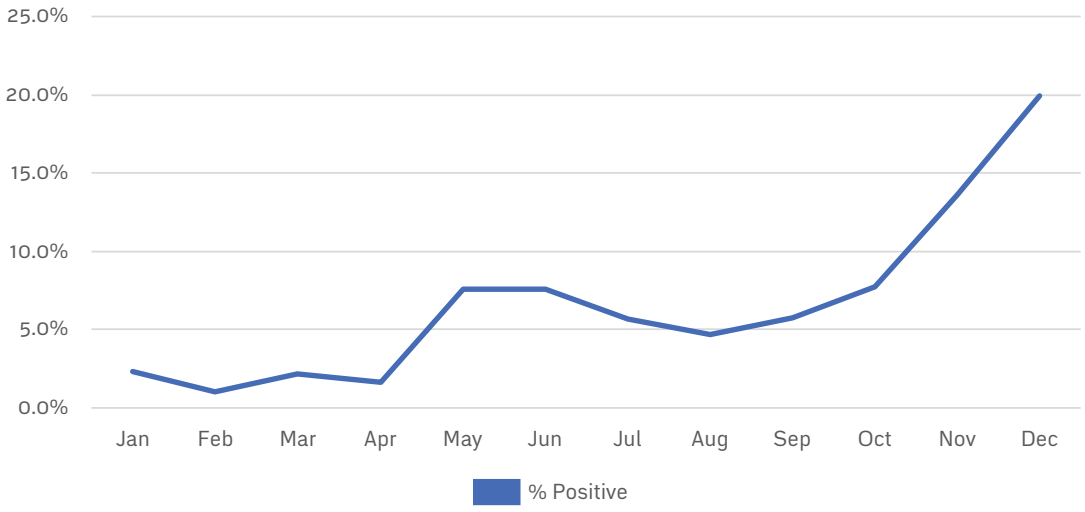

Figure 14. *Line graph showing the percentage of unregulated opioids samples containing para-fluorofentanyl each month in 2022*

Benzodiazepine Adulteration of the Unregulated Opioids Supply

A total of 3,180 unregulated opioid samples (39.8%) were confirmed as benzodiazepine-positive in 2022, as confirmed either by the FTIR spectrometer, or a positive immunoassay strip. Unregulated opioids in this section are referring to samples that were expected to contain fentanyl, heroin, fentanyl and heroin, or "down". There was an upward trend in the percent of unregulated opioid samples that tested positive for benzodiazepines each month across 2022, with a range from 28.2% of samples (134 samples) in January to 51.1% of samples (313 samples) in December (see **Figure 15**).

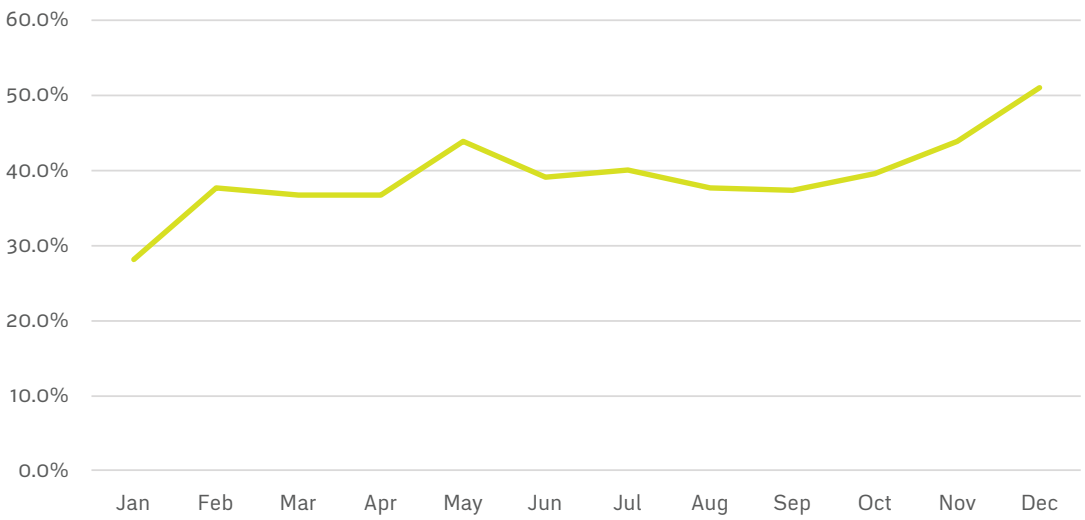

Figure 15. *Percentage of unregulated opioid samples per month that contained a benzodiazepine across BC in 2022*

Looking specifically at the benzodiazepines detected in unregulated opioid samples by the FTIR spectrometer each month, etizolam was the most frequently detected with a total of 180 samples (2.3% of all unregulated opioid samples) in 2022 (see **Figure 16**). Bromazolam had a total of 144 samples (1.8% of all unregulated opioid samples) and steadily increased in the number of samples detected by the FTIR spectrometer each month from July through December, with a peak of 37 samples detected in December. It is of note that the data shown in **Figure 16** are of benzodiazepine-positive unregulated opioid samples confirmed by the FTIR spectrometer only, as benzodiazepine strips cannot detect the specific type of benzodiazepine, and may not be fully representative of the benzodiazepines present in the unregulated opioid supply due to the detection threshold of the spectrometer.

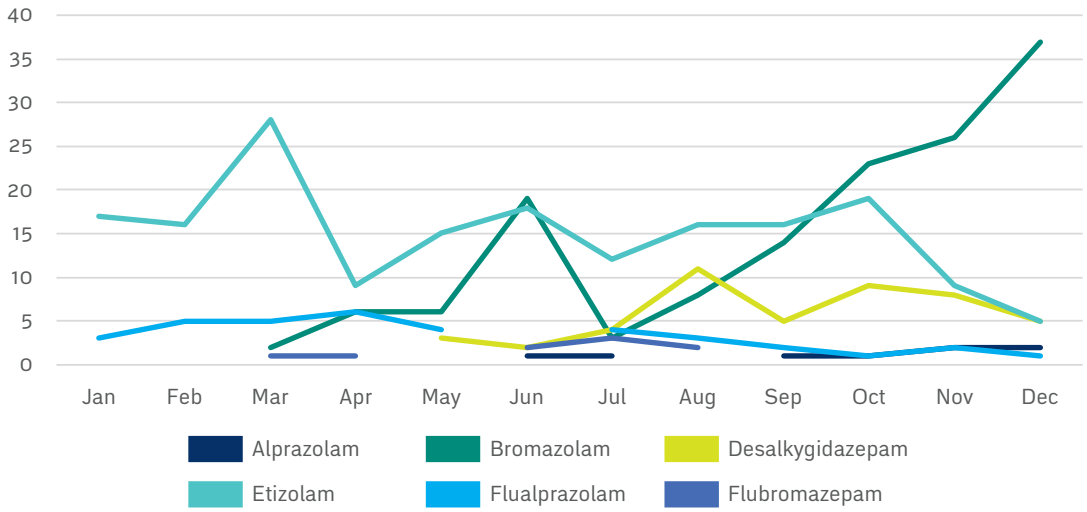

Figure 16. *Benzodiazepines detected by the FTIR spectrometer in unregulated opioid samples each month in 2022**

** Benzodiazepines detected in <5 total unregulated opioid samples in 2022 include: clonazolam, diazepam, diclazepam, lorazepam, desalkygidazepam, deschloroetizolam, flubromazolam, nimetazepam, nitrazepam, and nordazepam.*

Fentanyl Adulteration in Non-Opioid Substances

Table 1 examines the prevalence of fentanyl adulteration in non-opioid substances, based on the percentage of samples in each category that were confirmed to contain fentanyl with a positive immunoassay strip, detection with the FTIR spectrometer, or both. Within the stimulant category, expected-methamphetamine had 92 samples (7.1%) test positive for fentanyl, which can be caused by unintentional cross-contamination from baggies previously used to store opioids. The two depressants with the highest proportion of fentanyl-positive samples were expected-W-18 samples (4 samples; 100%) and flualprazolam (3 samples; 7.5%). Of the substances checked in the psychedelics category, expected-DMT had the lowest frequency of samples tested (83 samples), but the highest proportion of fentanyl-positive samples (1 sample; 1.2%), which may be due to unintentional cross-contamination. Additionally, the proportion of fentanyl-positive samples can be inflated with fewer samples being checked of a particular substance.

Category	Expected-Substance	Proportion Fentanyl-Positive (%)	Total number of submitted samples
Stimulants	Cocaine	1.2	2,425
	Crack Cocaine	6.2	421
	Methamphetamine	7.0	1,312
	Amphetamine	2.7	75
Depressants	Alprazolam	4.4	483
	Clonazepam	1.4	73
	Etizolam	4.8	62
	Flualprazolam	7.5	40
	Diazepam	2.3	44
	Lorazepam	5.6	18
	W-18	100	4
Psychedelics	MDMA	0.5	2,575
	Ketamine	0.2	1,354
	DMT	1.2	83
	MDA	0.5	181

Table 1. *Table showing percentage of fentanyl-positive samples for select substances in each non-opioid drug category based on FTIR spectrometry and immunoassay strips*

Depressants

A total of 996 samples (4.5% of all samples) were checked in the depressant category in 2022. Of the depressant samples, expected-alprazolam was the most commonly checked substance throughout the year, with the greatest number of samples in January (60 samples), and another peak in September of 51 samples (see **Figure 17**). GHB was the second most checked depressant from June through December, with the greatest number of samples being checked in October (18 samples).

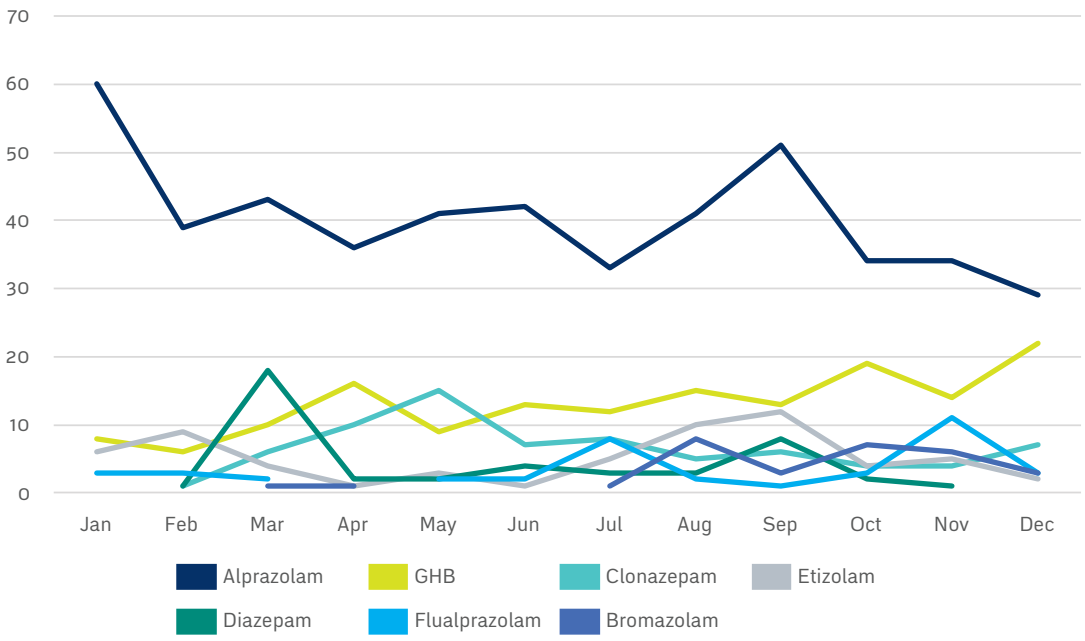

Figure 17. *Samples in the depressant category checked per month in 2022 across BC**

** Other samples checked in the depressant category that total <2% of samples include: GBL, lorazepam, flubromazolam, flubromazepam, methaqualone, desalkylgidazepam, xylazine, zopiclone, 1,4-butanediol, W-18, nordazepam, trazadone, zolpidem, gabapentin, 3-hydroxyphenazepam, 4-fluorophenibut, carisoprodol, clonazolam, clonidine, flunitrazolam, fluoro-GBL, phenibut, pregabalin*

Expected-Alprazolam Samples

Of the 996 depressant samples checked in 2022, 483 were expected-alprazolam samples. A total of 274 samples (56.7%) were confirmed to contain a benzodiazepine using an immunoassay strip, the FTIR spectrometer or a combination of both. The

three most common compounds determined to be in the concordant-alprazolam samples by the FTIR spectrometer were: microcrystalline cellulose (203 samples; 74.1%), Uncertain Oil (151 samples; 55.1%), and Uncertain Match (143 samples; 52.2%) (see **Figure 18**). An Uncertain Match or Uncertain Oil reading can be due to a spectrum signal being present that is not distinct enough to be detected as a unique substance, causing the technology to be unable to confirm a specific compound. Uncertain oil is typically associated with the binding agent included during the pill pressing process. An alternative reason could be that there was signal noise present, but no additional compound. Alprazolam was confirmed by the FTIR spectrometer to be in 22 samples (8.0%). The low prevalence of alprazolam within the components detected by the FTIR could be due to a sample being confirmed as benzodiazepine-positive by an immunoassay strip, but alprazolam being present in too low of a concentration to be detected by the FTIR spectrometer. Additionally, immunoassay strips can only detect the presence of benzodiazepines in general, meaning that alternative benzodiazepines may have been present aside from alprazolam.

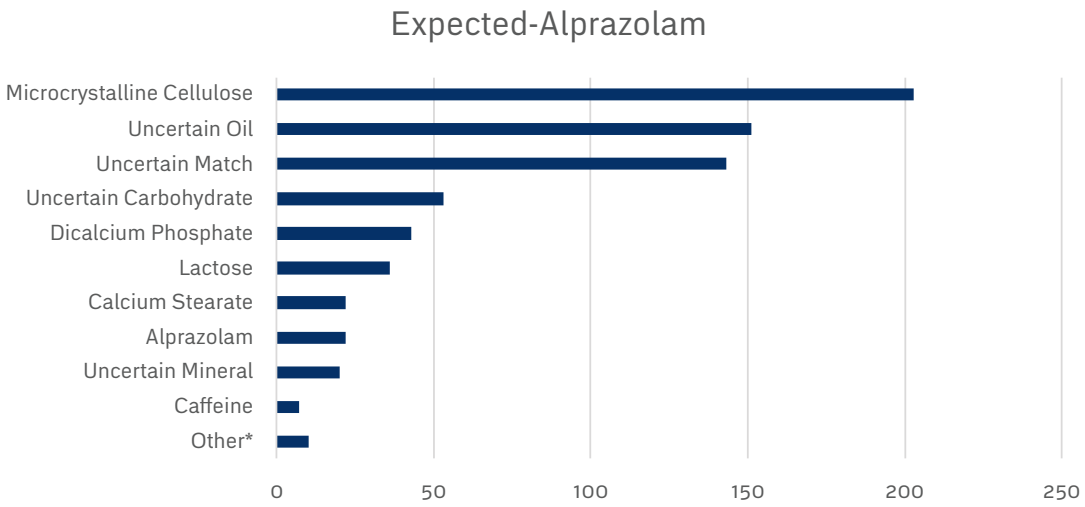

Figure 18. *Bar graph of the most common substances found in expectation-concordant alprazolam samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <2% of expected-alprazolam samples include: sucrose, etizolam, talc, calcium carbonate, mannitol, uncertain salt*

Stimulants

A total of 4,324 stimulant samples were checked in 2022, with cocaine consistently being the most frequently checked throughout the year (2,425 samples; 56.1%) (see **Figure 19**). August had the most cocaine samples checked (261 samples) and January had the fewest (125 samples). Methamphetamine was the second most checked stimulant throughout the year, with the most samples being checked in November (154 samples) and the least number of samples checked in January (70 samples). Crack cocaine and amphetamine both had fewer than 50 samples each month, except for November when 57 crack cocaine samples were checked.

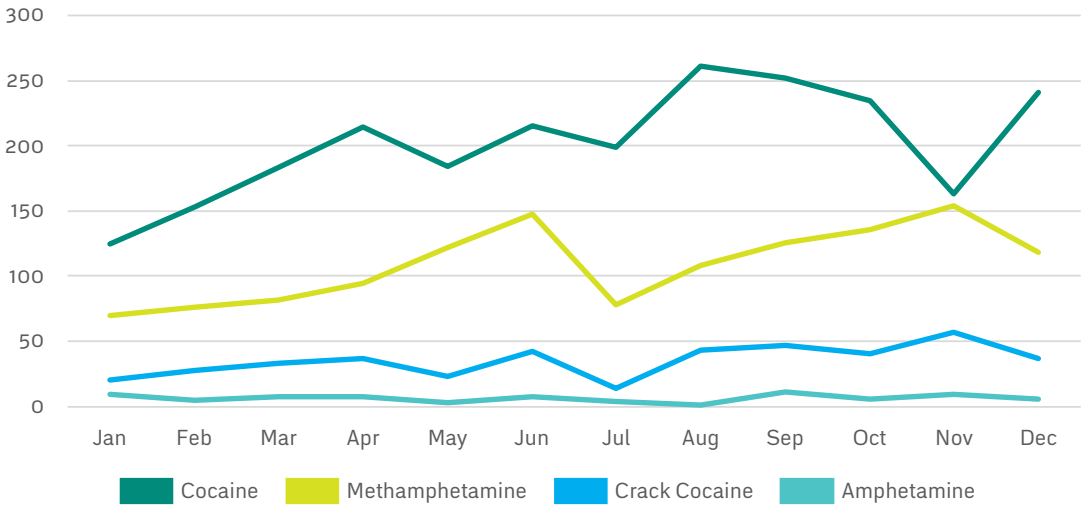

Figure 19. *Total number of stimulant samples checked each month in 2022 across BC**

** Other samples checked in the stimulant category that total <1% of all stimulant samples include: 2-FMA, 2-MMC, 3-FMA, 3-MMC, 4-MMC, 4F-MPH, ephedrine, lisdexamfetamine, methylhexanamine, methylphenidate, pseudoephedrine, speed*

Common Compounds Found in Stimulants

There was a total of 2,425 expected-cocaine samples submitted to drug checking 2022 and of those, 2,297 (94.7%) were confirmed to contain cocaine by the FTIR spectrometer (see **Figure 20**). There were 146 samples (6%) that contained an uncertain match, while the two most commonly detected buffing and cutting compounds were inositol (82 samples; 4%) and phenacetin (78 samples; 3%), respectively.

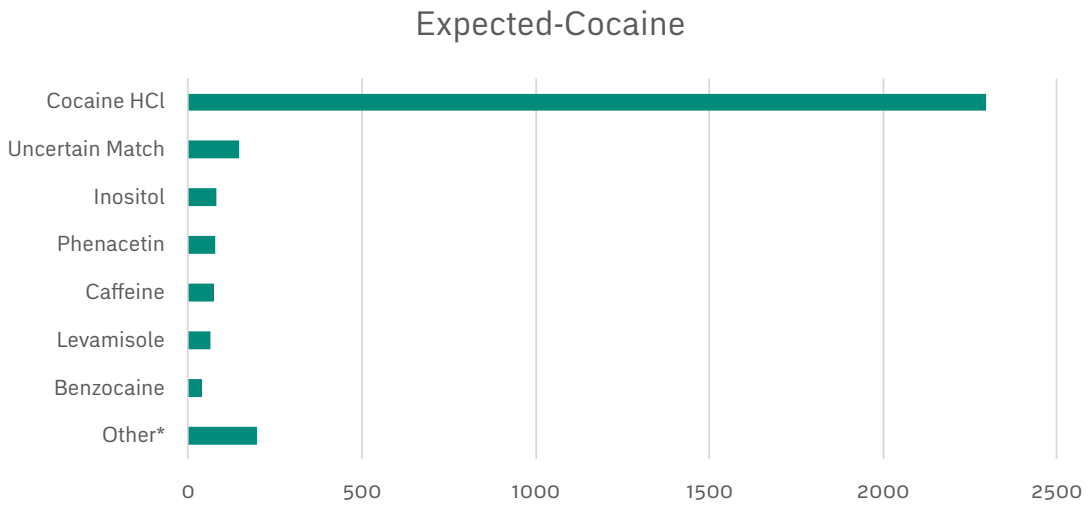

Figure 20. *Bar graph of the most common substances found in expectation-concordant cocaine samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <2% of expected-cocaine samples include: creatine, cocaine base, uncertain carbohydrate, talc, methamphetamine, glutamine, mannitol, acetaminophen, ketamine, uncertain oil, glucose, lidocaine, procaine, aspirin, boric acid, lactose, MDMA, 4-anilinopiperidine, amphetamine, sodium bicarbonate, sucrose, thiamine, aspartic acid, cannabidiol, dimethyl sulfone, erythritol, fentanyl or analogue, glucosamine sulfate, isoleucine, MDA, monosodium glutamate, uncertain salt, uncertain wax*

A total of 395 of the 421 (93.8%) crack cocaine samples submitted for drug checking contained cocaine base, as determined by the FTIR spectrometer (see **Figure 21**). The second most frequently detected compound by the FTIR spectrometer was phenacetin, a cocaine cut, in 85 samples (21.5%). A total of 32 samples (8.1%) were an uncertain match.

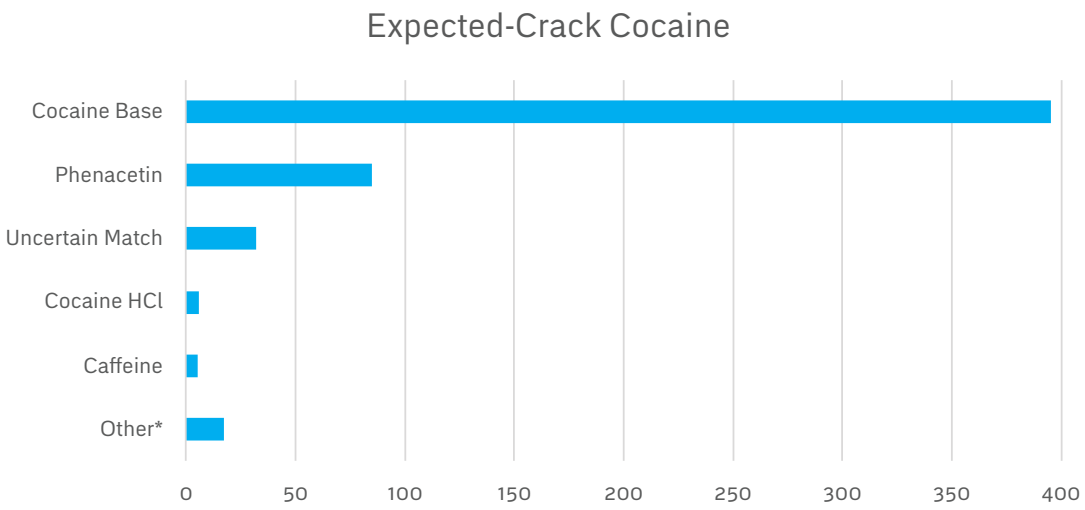

Figure 21. *Bar graph of the most common substances found in expectation-concordant crack cocaine samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <1% of expected-crack cocaine samples include: levamisole, acetaminophen, sodium bicarbonate, ketamine base, uncertain carbohydrate, dimethyl sulfone, erythritol, fentanyl or analogue, methamphetamine*

A total of 1,312 methamphetamine samples were submitted for drug checking in 2022, with 1,273 samples (97.0%) being confirmed to contain methamphetamine (see **Figure 22**). Dimethyl sulfone, a common methamphetamine cut, was the second most frequently detected compound in the concordant-methamphetamine samples (91 samples; 7.1%), followed by 81 samples (6.3%) that were an uncertain match.

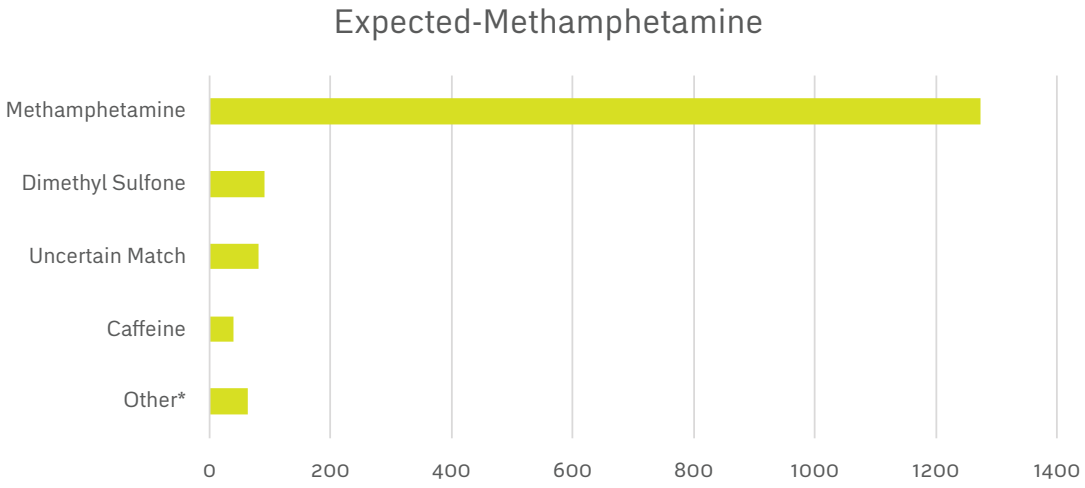

Figure 22. *Bar graph of the most common substances found in expectation-concordant methamphetamine samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <1% of expected-methamphetamine samples include: uncertain oil, erythritol, fentanyl or analogue, microcrystalline cellulose, cocaine HCl, fentanyl, levamisole, mannitol, amphetamine, sucrose, xylitol, 4-Anilino-1-Boc-piperidine, benzocaine, calcium carbonate, cocaine base, fructose, isopropylbenzylamine, methylamine, phenethylamine, sodium bicarbonate, t-Boc methamphetamine, talc, uncertain salt*

Psychedelics

A total of 4,881 psychedelic samples (22.1% of total samples) were submitted for drug checking in 2022. This category captures a wide range of substances–including MDMA, MDA, ketamine, LSD, and DMT–with a focus on MDMA and ketamine given that they are the predominant substances checked in the psychedelics category (see **Figures 24** and **25**). MDMA was consistently the most checked psychedelic substance checked throughout the year, with January having the fewest samples checked (82 samples), and a peak of 337 samples in July (see **Figure 23**). The next most frequently checked psychedelic throughout the year was ketamine, with the least number of samples checked also in January (65 samples), and the greatest number of samples checked in September (172 samples). Pop-up drug checking access points at small music festivals occurred in July and September, which could explain the increase in MDMA and ketamine checked during those months. LSD, MDA, 2C-B and DMT all had fewer than 50 samples each month throughout the year.

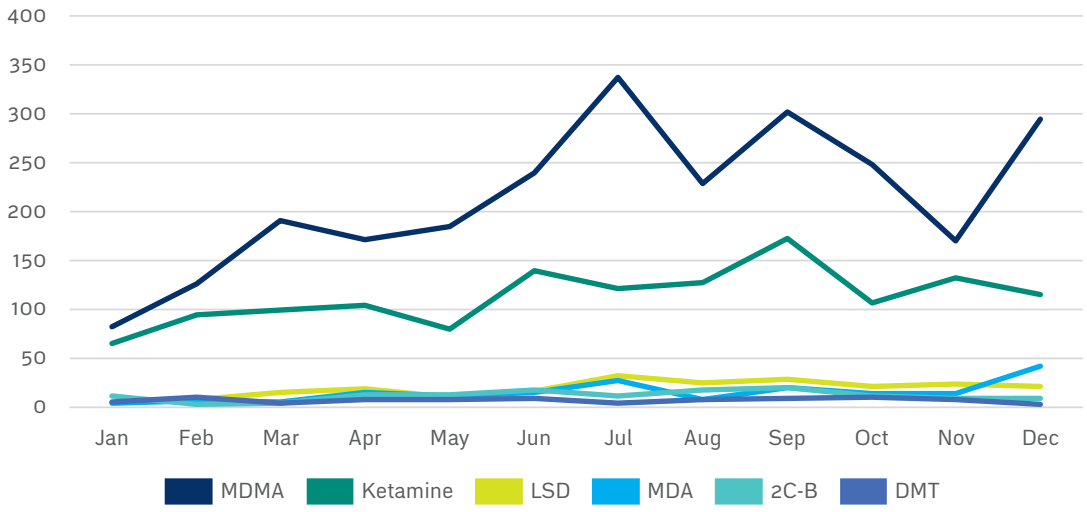

Figure 23. *Number of samples checked in the psychedelic category each month in 2022 across BC**

** Other compounds checked in the psychedelics category in <1% of the total samples include: 5-MeO-DMT, 4-AcO-DMT, THC, mescaline, 4-HO-MET, 5-MeO-DiPT, MD-X (Unknown), MDA and MDMA, Mushroom and Derivatives, tucibi, 5-MeO-MiPT, 5-MT, CBD, Cannabis and Derivatives, 3-HO-PCP, O-PCE, DMXE, 4-HO-MiPT, MXE, methallylescaline, DPT, changa, 4-AcO-MET, PCP, DOM, 5-MeO-MALT, 4-PrO-DMT, 2C-I, 2-CB family, 2C-B-FLY, proscaline, MXiPr, MPT, MiPT, LSD and MDA, Ketamine and MDMA, DOC, diphenidine, AMT, 6-APB, 5-MeO-DALT, 5-MAPB, 4-HO-PiPT, 4-HO-DiPT, 3-MeO-PCE, 3-HO-PCE, 2C-T-2, 2C-E, 2C-D, 25I-NBOMe, 1P-LSD*

Common Compounds Found in Psychedelics

There were 2,575 expected-MDMA samples checked in 2022, of which 2,288 (88.9%) contained MDMA (see **Figure 24**). There were 132 samples (5.8%) found as an uncertain match, while the next most identified compound by the FTIR spectrometer was microcrystalline cellulose in 89 samples (3.9%). Microcrystalline cellulose is an inactive compound added as a tablet excipient.

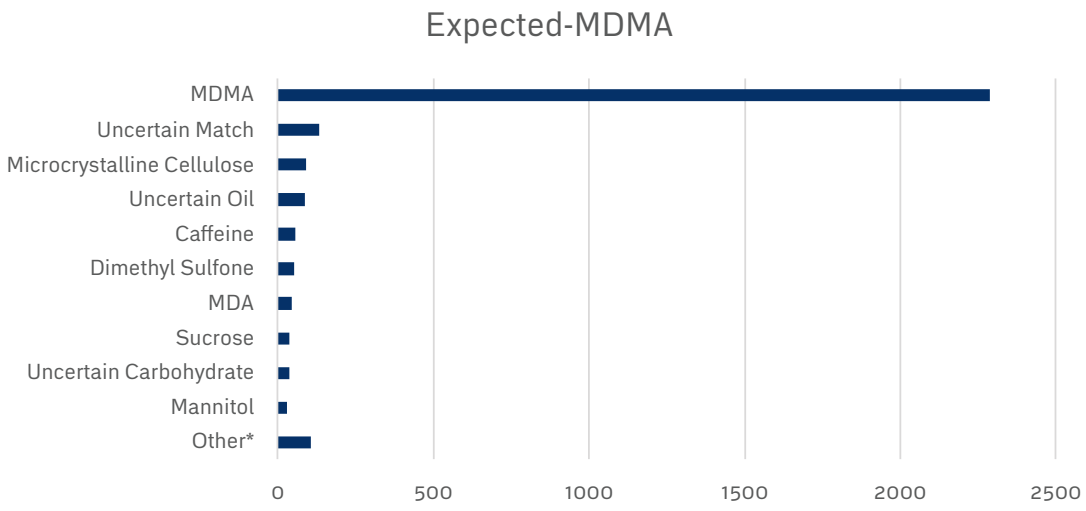

Figure 24. *Bar graph of the most common substances found in expectation-concordant MDMA samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <1% of expected-MDMA samples include: glutamine, inositol, dicalcium phosphate, methamphetamine, creatine, ketamine, safrole, cocaine HCl, glucose, lactose, ethylone, polyethylene glycol, sodium bicarbonate, uncertain mineral, xylitol, alkyl nitrates, amoxicillin, amphetamine, benzocaine, etizolam, fructose, magnesium sulfate, sorbitol, TFMPP, uncertain salt*

In 2022, 1,307 of the total 1,354 (96.5%) expected-ketamine samples checked were concordant and found to contain ketamine by the FTIR spectrometer (see **Figure 25**). A total of 138 samples (10.6%) were an uncertain match. The most frequently identified compound in the 1,307 concordant ketamine samples was dimethyl sulfone, a cutting agent, in a total of 56 samples (4.3%).

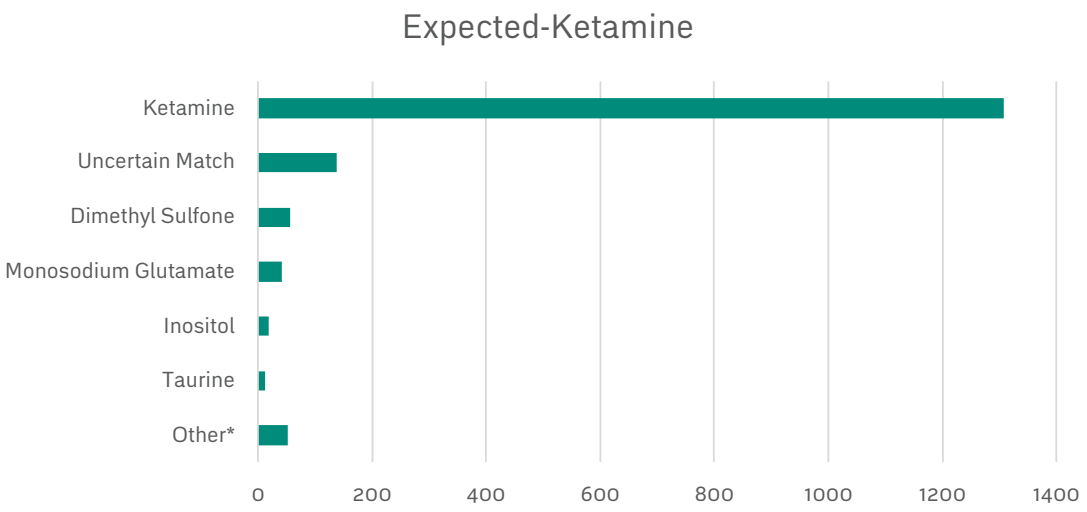

Figure 25. *Bar graph of the most common substances found in expectation-concordant ketamine samples, as confirmed by FTIR spectroscopy*

** Other compounds present in <1% of expected-ketamine samples include: uncertain mineral, cocaine HCl, uncertain carbohydrate, magnesium sulfate, methamphetamine, caffeine, MDMA, uncertain oil, creatine, no library match, procaine, uncertain salt, 2-FDCK, calcium stearate, diphenhydramine, erythritol, glutamine, ketamine base, phenacetin, sucrose*

Limitations

Both technologies used at drug checking sites, the FTIR spectrometer and the immunoassay strips, have limitations in what they can detect. The FTIR spectrometer can detect up to six compounds within a given sample, including active substances, cuts and buffs, which means that in samples with more than six compounds, not all compounds may be identified. Additionally, compounds are determined by using reference libraries and can't be identified if the compound isn't available in the library. Lastly, the FTIR spectrometer has a detection threshold of 5-10%, as previously discussed, which can impact the sample analysis and subsequent harm reduction messaging. In particular, fentanyl analogues, such as carfentanil, may be present in concentrations lower than the 5% threshold and can't be detected by the FTIR spectrometer, but may still be present in a high enough concentration to cause overdoses due to its high potency.[9,10] Fentanyl immunoassay strips are validated to detect fentanyl in samples, but may not reliably detect all analogues, like carfentanil.[2,3,11]

The immunoassay strips are used in combination with the FTIR spectrometer because they have a higher sensitivity and can detect compounds present in a lower concentration, but they may not detect all fentanyl or benzodiazepine analogues consistently.[5,12] As an example, etizolam, a thienotriazolodiazepine derivative that is structurally similar to benzodiazepines is not reliably detected by benzodiazepine test strips when compared to traditional benzodiazepines, such as alprazolam.[13] Additionally, the poor water soluability of benzodiazepines pose a challenge to the test strip's ability to detect them.

The data presented in this report is not fully representative of the unregulated drug supply in BC, due to the data only being collected through drug checking sites, as well as the limitations of the technology used to test all types of samples (i.e., organic samples like mushrooms, cannabis). The limited hours and locations impact the accessibility of the service for people and may lead to a selection bias within the data, as it only captures the samples people have voluntarily brought in to be checked. Alternatively, the increase in the number of access points in all five health regions in BC could provide a more representative look at the drug supply across the province, consequently levelling out trends compared to data from previous years that had fewer drug checking access points.

Conclusion

Drug checking data has been collected from community partner sites across BC since 2017, which gives valuable insight into how the unregulated drug supply has changed over time in the province. When comparing the number of samples in first full year of drug checking services being offered in 2018 to the data from 2022, there was an expansive 363% increase as the number of access points and health authority regions the service is offered in continue to expand. As of 2022, drug checking services are now available in at least one location in every health authority region. Similar to the data in the 2021 report, the Vancouver Coastal Health region consistently had the most drug checks completed each month in 2022, which could be due to the number of drug checking sites available and the population density in the region compared to elsewhere in BC.[14] The number of drug checking access points was shown to have an impact, as the Fraser Health region had four additional sites starting in July and the number of samples checked per month steadily increased from August through December.

Opioids were consistently the most checked category across the year, followed by stimulants and psychedelics. The psychedelics category saw an increase in samples both in July and September, which could correspond to seasonal substance use patterns associated with music festivals such as Altitude, Wicked Woods, FVDED in the Park and Electric Love, as psychedelic drugs have been found to be the most frequent drug type checked at previous music festivals.[15] The occurrence of the smaller music festivals during those months could also account for the increase in overall samples checked, as there were pop-up drug checking locations available for people on-site, increasing accessibility to the service and highlighting the utilization of drug checking in festival settings. Data from the 2022 Bass Coast and Shambhala music festivals were not included in this report, as it was collected through the IH Harm Reduction Program and can be viewed at https://drugchecking.ca/2022-festival-infographic/.

When comparing the concordance of expectation to the sample FTIR spectrometer results across the drug categories, all of the categories matched expectations in more than 50% of all samples checked, with stimulants being the most concordant drug category. Both opioids and benzodiazepines were tested using the FTIR spectrometer and the corresponding immunoassay strip to determine fentanyl or benzodiazepine positivity and sample concordance. While a sample may test positive for fentanyl or benzodiazepines using an immunoassay strip, this may not be reflected in the FTIR spectrometer sample analysis due to the low detection threshold, which was reflected in the breakdown of compounds found in fentanyl, “down”, heroin, and

alprazolam. Despite matching expectations, fentanyl, "down", heroin, and alprazolam samples did not have the expected substance as the predominant compound when looking at the FTIR spectrometer results due to the limited detection threshold, showing the importance of pairing the spectrometer results with immunoassay test strips to provide results with both a high sensitivity and specificity.

Looking specifically at how the unregulated opioid supply changed, benzodiazepine adulteration and increasing fentanyl concentrations in 2022 suggested a continuation of trends seen in data from previous years.[16,17] The 2022 data showed an increase in fentanyl concentration throughout the year, both in the Vancouver DTES Neighbourhood and elsewhere in BC. The two regions never had a greater than 4% difference in the median fentanyl concentration and both regions remained consistently above a median 14% fentanyl concentration from August onwards. This differed from the previous year's data, as there was a greater difference in concentrations between the DTES neighbourhood and elsewhere in BC throughout the year in 2021, creating a potential risk to individuals travelling to the DTES neighbourhood who may be unaware of the increased fentanyl concentration in the area.[14] In 2022, the relatively large increase in median fentanyl concentration from 9.4% in January to 14.3% in December in communities elsewhere in BC poses a risk in individuals who aren't expecting the increased concentration and may not have a tolerance for substances with 14% fentanyl. The increasing fentanyl concentration in the unregulated opioid supply poses a harm reduction challenge, as it can increase the risk of overdoses across the province.

Benzodiazepines also were increasingly present in unregulated opioid category samples (i.e., fentanyl, heroin, fentanyl and heroin, or "down" samples), starting with 28.2% of samples testing positive in January, to 51.1% of samples testing positive in December. This continued the trend from 2021, which had 34.4% of unregulated opioid samples testing positive for benzodiazepines in December 2021. The increasing prevalence of benzodiazepines poses a harm, as both opioids and benzodiazepines have sedation effects, which can increase the risk of an overdose from substances containing both compounds.[18] The benzodiazepines detected by the FTIR spectrometer in unregulated opioid samples changed throughout the year, from predominantly etizolam to bromazolam. The change in the type of benzodiazepine detected from etizolam is important to note because, as previously discussed, it could impact the rate of benzodiazepine detection with immunoassay strips.[13] While the number of samples that tested benzodiazepine-positive consistently increased throughout the year, that could be due, in part, to the immunoassay strips being able to more reliably detect the presence of bromazolam compared to etizolam in a sample rather than strictly being caused by an increase in prevalence of benzodiazepines in the unregulated opioid supply.

In addition to benzodiazepines, xylazine and para-fluorofentanyl were also found to be increasingly present in unregulated opioid samples throughout 2022. Xylazine is a veterinary tranquilizer, which poses a risk similar to benzodiazepines, as xylazine will cause a combined sedation with the opioid, with the added risk of the compound not being approved for human use.[7] While there is limited data available pertaining to the potency of para-fluorofentanyl relative to fentanyl, the emergence of the compound in unregulated opioid samples is still of concern because it highlights the increasing unpredictability of the unregulated drug supply.[8] Both xylazine and para-fluorofentanyl are present in unregulated opioids in relatively few samples compared to benzodiazepine adulteration, but it's a trend that will be continuously monitored throughout 2023.

Drug checking services provide important information to people accessing the service, giving people the ability to make informed harm reduction decisions in an ever-changing, unpredictable, unregulated drug supply. By looking at trends in the community drug checking results, public health providers can gain insight into the current supply and be more responsive to novel changes, such as the increasing prevalence of benzodiazepines, xylazine, and para-fluorofentanyl in the unregulated opioid supply. To further evaluate the role drug checking plays in harm reduction, future studies could examine the prevalence of overdose and other adverse events in areas that had an increase in drug checking access points, in comparison to areas without community-based drug checking services.

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