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Adulterants, Contaminants and Co-occurring Substances in Drugs on the Illegal Market in Canada

An Analysis of Data from Drug Seizures, Drug
Checking and Urine Toxicology

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Executive Summary

The inherent risks of substance use are significantly increased for drugs procured on the illegal market, where there is no quality control and drug contents are unpredictable. Drug adulteration – the presence of substances in addition to the expected one – increases the risk of accidental poisoning and other harms because people who use drugs do not know what substances they are using or how much.

This report provides a snapshot of the contents of drugs on the unregulated market in Canada, with the view to raising awareness among stakeholders, including people who use drugs, direct service providers and policy makers, that adulteration is extensive and pervasive, and contributes significantly to drug-related harms.

The report summarizes data from three primary sources:

- **Health Canada’s Drug Analysis Service (DAS)**, which identifies substances contained in samples seized by law enforcement;
- **A drug content monitoring study** consisting of surveys of people who use drugs and concurrent urine screening (urinalysis) results; and
- **Drug checking service providers** who are members of Canada’s national Drug Checking Working Group.

Across these data sources, the trends described below emerged.

Drugs on the Illegal Market Tend to Contain Unexpected Substances

In samples analyzed by DAS, many co-occurring substances were present:

- Among opioid-containing samples, one in eight (13%) contained another psychoactive substance, increasing to over two-thirds (69%) when including cutting agents;
- Among methamphetamine-containing samples, more than one in ten (11%) contained another psychoactive substance, increasing to almost half (46%) when including cutting agents; and
- Among cocaine-containing samples, one in 20 (5%) contained another psychoactive substance, increasing to almost a third (29%) when including cutting agents.

Drug checking and drug content monitoring data confirmed that this co-occurrence is not always expected or wanted.

Fentanyl and Its Analogues Are Common in the Illegal Drug Supply

Nationally, fentanyl or analogues were present in nearly two-thirds (62%) of opioid-containing samples and up to 3% of stimulant-containing samples (DAS data). In British Columbia fentanyl or analogues were present in 91% of opioid-containing and up to 10% of stimulant-containing samples.

Fentanyl and Its Analogues Are Not Always Used Intentionally or Knowingly

Among survey respondents with fentanyl-positive urine screens (59% of respondents in B.C., 10% in Montreal), over one-third (36%) in B.C. and over 90% in Montreal did not report consuming fentanyl, suggesting they were unintentionally or unknowingly exposed.

Drug checking data from Ontario and B.C. indicated fentanyl in samples expected to be heroin or stimulants, and in pills resembling Percocet™ (oxycodone and paracetamol) and Xanax™ (alprazolam).



Presence of fentanyl in non-opioid drugs is particularly concerning as accidental poisoning is more likely among people who are not expecting opioids and might be opioid-naïve or have low tolerance.

Drug checking also detected carfentanil and other fentanyl analogues in samples expected to be fentanyl. This is of concern because some analogues are more toxic than fentanyl.

Other Unexpected Psychoactive Substances Can Also Contribute to Health Risks

Increasingly, reports also point to the presence of other substances associated with health risks in the unregulated drug supply. These substances include:

- Novel synthetic opioids (particularly U-47700 and other compounds in the U-series);
- Benzodiazepines (particularly etizolam, flualprazolam and flubromazolam); and
- Synthetic cannabinoids (particularly AMB-FUBINACA).

These substances are of concern because they can alter overdose symptoms and respond differently to overdose interventions (e.g., benzodiazepines do not respond to naloxone), and they are not always detected by drug checking (e.g., immunoassay test strips).

There Is Significant Regional Variation in the Findings

In western Canada:

- There is more fentanyl than in samples seized in the east.
 - 91% of opioid-containing samples in B.C. included fentanyl or an analogue, compared to 69% nationwide, 55% in Ontario and 14% in the province of Quebec (DAS data).
 - In B.C., fentanyl was the third-most reported drug to have been recently used, whereas it was not in the top five in Montreal.
- The presence of fentanyl in stimulants might be greater than in the east.
 - In B.C., fentanyl and analogues were present in 10% of methamphetamine-containing samples and 7% of cocaine-containing samples, compared to 3% nationally and less than 1% in Quebec.
- Opioids are more often contaminated with other substances than in the east.
 - 91% of opioid-containing samples in B.C. contained other, non-opioid substances (primarily cutting agents), compared to 25% in the province of Quebec.

In eastern Canada:

- Even though there appears to be more stimulant-related harm occurring in western Canada, stimulants are more widely available in eastern Canada than opioids.
 - The three drugs reported as most frequently used in Montreal among clients accessing harm reduction services were stimulants: crack, cocaine and “speed.”
 - The highest number of methamphetamine-containing samples analyzed by DAS were seized in Quebec (38% of all methamphetamine-containing samples nationwide).
- Stimulants are more often contaminated with other substances than in the west.
 - 95% of methamphetamine-containing samples in Quebec contained other substances (primarily cutting agents), compared to less than 14% in the Prairies and B.C. (DAS data).



- However, in the west stimulant-containing samples were more likely to include fentanyl and its analogues, which might be why more harms associated with methamphetamine are reported in western Canada.

Implications

Based on the results presented in this report, the following next steps should be considered.

Establish a Canadian drugs observatory service to:

- Monitor drug contents and track adverse health effects to identify concerning trends;
- Improve harmonization of data collection to allow comparison across regions in Canada;
- Rapidly disseminate drug-related health alerts and response options; and
- Raise public awareness of the link between drug unpredictability and health harms.

Further develop treatment and harm reduction services, including support for:

- Education and dissemination of information among people who use drugs to ensure they are aware of contaminants, harm reduction options and substance poisoning interventions;
- Sustainability and scale up of easily accessible harm reduction services (e.g., drug checking and supervised consumption services) to increase national coverage;
- Continued naloxone availability and overdose response training, including updated protocols to respond to inadvertent polysubstance use; and
- Increased investment in a range of treatment options to ensure that people who use drugs and those with a substance use disorder receive the needed services.

Decrease drug-related harms by advancing approaches that increase the predictability of drug contents. Such approaches include “safer supply” programs such as injectable opioid agonist treatment (Fairbairn et al., 2019) and low-barrier opioid distribution programs (Tyndall, 2018). As the evidence around these approaches is limited, next steps could include:

- Synthesizing the available evidence to identify research gaps and formulating recommendations to address them;
- Exploring and evaluating various models of delivery for such interventions to produce evidence-informed recommendations for program development, scale-up and sustainability;
- Evaluating context variables to assess what works best, for whom and why, as well as evaluating the long-term safety and efficacy of these interventions;
- Investigating the feasibility of applying a similar approach to non-opioid drugs, in light of our finding that contamination is widespread across the drug supply and that there is increased methamphetamine use across the country. Proposals for stimulant substitution or distribution programs have been put forward (Canadian Association of People Who Use Drugs, 2019; Fleming, Barker, Ivins, Vakharia, & McNeil, 2020), and could be piloted and evaluated; and
- Analyzing the regulatory and policy barriers that need to be addressed, and employing the policy levers and facilitators that are available, to enable the development, scale-up and stability of successful interventions beyond the pilot phase.

It will also be important to monitor and assess whether large scale social changes resulting from the COVID-19 pandemic will influence the illegal drug supply (e.g., disruption of local distribution networks due to self-isolation) and level of contamination in the drug supply.



Background

Introduction

Use of any substance carries with it inherent risks. However, this risk is substantially increased for products purchased on the illegal, unregulated market as there is no quality control. It is common practice in the unregulated market to mix additional substances into drugs to add bulk or enhance the effects. It is also possible to unintentionally include contaminants as a by-product of the manufacturing process (Cole et al., 2011). As a result, drugs can contain unexpected substances of unknown quantities and have unknown potency and toxicity. This increases the risk of accidental poisoning and other harms as people do not know what substances they are using or how much.

This report is intended to accompany the [CCENDU Bulletin of the same name](#) and provides much of the technical details and methods used to generate the results presented in the bulletin. The Canadian Community Epidemiology Network on Drug Use (CCENDU) is a nationwide network of community-level partners in 10 locations across the country who share information about local trends and emerging issues in substance use that they see in their own communities. CCENDU has reported on accidental substance poisoning trends in the past (CCENDU 2014, 2016, & 2019).

This report provides an overview of the array of substances frequently found in drugs on the unregulated market in Canada, using data from multiple sources. The report aims to raise awareness that drug adulteration is extensive and pervasive, and contributes to drug-related harms, with a view to enabling more informed decision making among stakeholders, including people who use drugs (e.g., using harm reduction services or not using alone), direct service providers (e.g., managing unintentional polysubstance use among people accessing services) and policy makers (e.g., investigating options for creating a more predictable drug supply).

Results are based on the best available data, but due to data collection limitations they do not provide a comprehensive account of all substances currently found in drugs circulating on the unregulated drug marketplace.

Method

Data sources for this report are described in detail in **Appendix A**. In brief, they include:

- **Health Canada's Drug Analysis Service (DAS):** A service that analyzes suspected illegal drugs seized by law enforcement. The data generated by DAS include all substances contained in each sample, but not their quantities or what the substance was intended to be bought or sold as. The report includes DAS data from April 2018 to August 2019.
- **Canadian Border Services Agency (CBSA):** This agency also analyzes select samples seized at Canadian ports of entry. For this report, CBSA provided results of fentanyl, methamphetamine and cocaine seizures. The report includes CBSA data from 2017 to July 2019.
- **Drug Content Monitoring Study:** A research pilot by the B.C. Centre for Disease Control and Centre intégré universitaire de santé et de services sociaux du Centre-Sud-de-l'Île-de-Montréal, comparing self-reported recent substance use to urinalysis results. Data were collected between May and August 2018 in B.C. and between August and September 2018 in Montreal.
- **Drug Checking Working Group (DCWG):** A collection of drug checking service providers and researchers from across Canada. For this report, DCWG members provided information on the



contents of submitted samples along with information on service user expectations. The reporting timeframe spans 2018 and 2019.

- **Life Labs:** A commercial laboratory providing urinalysis services. For this report, they provided a summary report of aggregated urine toxicology results indicating exposure to certain substances. This report uses data released in August 2019, reporting on the previous 26 weeks.

An Important Note on Terminology

Cole et al. (2011) describe several categories of substances that can be present in drugs in addition to the expected substance. These categories have important differences, but for the purpose of this report we collectively refer to them as **adulterants**. They include:

- Adulterants: Pharmacologically active ingredients that are added to enhance or mimic the effects of the expected substance;
- Diluents: Inert substances added for bulk, such as talcum powder or sugar; and
- Contaminants: By-products of the manufacturing process and unintentionally added substances (e.g., cross-contamination from poorly cleaned scales).

While people who use drugs are often aware that adulteration occurs during production or distribution of illegal drugs, we use the term **unexpected** to refer to a lack of awareness of specific adulterants and their concentration in a given sample.

In describing the contents of drugs purchased on the unregulated market, terminology can be challenging as the most frequently used terms, adulterant or contaminant, are ambiguous unless the expectation of the individual using the drug is known. For clarity, we use the terms **adulterant** or **contaminant** in situations where expectations can be assessed (e.g., drug checking), and the term **co-occurring substance** when the expectation of the contents is unknown (e.g., DAS data).

Further, since DAS does not report the quantity of each substance in a sample, it is unknown whether a given substance is the dominant ingredient or merely present in trace amounts. For this reason, it is not possible to use terms such as “opioid samples” or “stimulant samples” when describing the DAS data. We use **opioid-containing samples** to refer to samples that contain any amount of at least one opioid, including heroin, fentanyl, fentanyl analogues, non-fentanyl synthetic opioids and others, and **stimulant-containing samples** to refer to samples that contain any amount of at least one stimulant, for this report including methamphetamine, cocaine or MDMA.

The term **cutting agent** refers to adulterants or co-occurring substances that are typically not psychoactive and are unlikely to contribute to accidental substance poisoning, although some may be associated with other health risks (Brunt, van den Berg, Pennings, & Venhuis, 2017; Carcinogenic Potency Project, 2007).

Finally, in line with the *Lexicon of Non-Stigmatizing Substance Use-Related Language* developed by the Public Health Agency of Canada (2020), we refer to **(accidental) substance poisoning** rather than **overdose**, where possible, except when the latter is part of a commonly used phrase (e.g., “overdose response team”).



Results

This section is a non-exhaustive sampling of the contents of drugs circulating on the unregulated market, illustrating how common and diverse drug adulteration is in Canada.

The main, high-level findings are as follows:

- Drugs bought and sold on the illegal market frequently contain unexpected psychoactive substances and cutting agents.
- Fentanyl and its analogues are common in the illegal drug supply, but are not always used intentionally or knowingly.
- Other psychoactive adulterants such as benzodiazepines, non-fentanyl synthetic opioids and synthetic cannabinoids are also present in the illegal drug supply and contribute to health risks.
- There is significant regional variation in supply, demand and co-occurrence of substances.

Unexpected Psychoactive Substances and Cutting Agents

Key Finding	Drugs obtained on the illegal market tend to contain unexpected substances		
Supported By	DAS data ✓	Drug content monitoring study ✓	Drug checking ✓
Section Summary	A significant number of drugs circulating on the Canadian market contain multiple substances. Over two-thirds of opioid-containing samples analyzed by DAS contained additional, non-opioid substances. Up to half of stimulant-containing samples also contained additional substances. Many of these additional substances were cutting agents and there was significant regional variation (see section on regional variation, below). Drug checking and drug content monitoring (survey and urinalysis) data showed that the presence of multiple substances is often unexpected and creates a mismatch between drug contents and consumer expectations.		

Between April 2018 and August 2019, DAS analyzed 167,630 unique samples submitted nationwide. Of these samples:

- 23% (n = 38,429) contained cocaine;
- 22% (n = 37,625) contained methamphetamine;
- 14% (n = 23,338) contained an opioid; and
- 2% (n = 2,777) contained MDMA.

Tables 1a and 2 present information on the composition of these samples. The tables specify the frequency with which additional substances appeared alongside substances of interest, with particular attention to opioids, benzodiazepines and synthetic cannabinoids, based on trends from other data sources. Table 1b details the frequency with which certain opioids of interest appeared among the opioid-containing samples.

The DAS data summarized in Tables 1a and 2 indicate that:

- Over two-thirds of opioid-containing samples (69%) contained at least one other, non-opioid substance. However, much of this was accounted for by cutting agents such as caffeine, dimethylsulfoxide and non-opioid pain relievers.



- Excluding cutting agents, 13% of opioid-containing samples contained at least one other **psychoactive** substance.
- About half (46%) of methamphetamine-containing samples contained additional substances, much of this accounted for by cutting agents such as caffeine and diphenhydramine.
 - Excluding cutting agents, 11% contained additional **psychoactive** substances.
- Nearly a third (29%) of cocaine-containing samples also contained additional substances, much of this accounted for by cutting agents such as phenacetin, local anesthetics and levamisole.
 - Excluding cutting agents, 5% contained additional **psychoactive** substances.

Table 1a. Non-opioid substances in opioid-containing samples submitted to DAS (April 2018 – August 2019; n = 23,338)

Co-occurring substances	Appear in number (%) of samples
None, only opioids present	7,242 (31%)
Other psychoactive substances (any)	2,998 (13%)
Benzodiazepines ¹	85 (<1%); of these, 57 (67%) etizolam
Synthetic cannabinoids	70 (<1%)
Other commonly detected psychoactive substances ²	Methamphetamine: 1,193 (5%) Cocaine: 1,025 (4%)
Cutting agents ³	Caffeine: 13,818 (59%) Dimethylsulfone: 2,963 (13%) Non-opioid analgesics: ⁴ 1,903 (8%); of these, 340 (18%) phenacetin

Table 1b. Specific opioids of interest in opioid-containing samples submitted to DAS (April 2018 – August 2019; n = 23,338)

Opioid of interest	Appears in number (%) of samples
Heroin	5,136 (22%)
Fentanyl or fentanyl analogues	14,424 (62%); of these, 1,999 (14%) carfentanil
Non-fentanyl synthetic opioids ⁵	196 (1%); of these, 184 (94%) U-47700

Note: The categories of co-occurring substances are not mutually exclusive and therefore do not add up to the total n.

1 This category also includes “z-drugs,” which are not benzodiazepines but have similar effects.

2 Detected in more than 1% of samples.

3 Cutting agents include acetaminophen, acetylprocaine, acetylsalicylic acid, benzocaine, caffeine, chlorprocaine, chloroquine or its salts, dimethylsulphone, hydroxychloroquine or its salts, levamisole, lidocaine, mannitol, phenacetin, procaine, quinine or its salts or derivatives, and quinidine.

4 Non-opioid analgesics include phenacetin, acetaminophen and ibuprofen.

5 Non-fentanyl synthetic opioids include U-47109, U-47700, U-48520, U-48800, U-49900, U-50211, U-50221, U-51754, U-77891 and NMU-47931E.



Table 2. Substances detected in stimulant-containing samples submitted to DAS (April 2018 – August 2019)

	Methamphetamine (n = 37,625)	Cocaine (n = 38,429)	MDMA (n = 2,777)
Co-occurring substances	Number (%) of samples	Number (%) of samples	Number (%) of samples
None – only the specific stimulant present	20,285 (54%)	27,342 (71%)	2,293 (83%)
Other psychoactive substances (any)	4,246 (11%)	2,044 (5%)	415 (15%)
Opioids (any)	1,193 (3%)	1,025 (3%)	43 (2%)
Heroin	279 (1%)	216 (1%)	4 (<1%)
Fentanyl or fentanyl analogues	1,021 (3%) Of these, 165 (16%) carfentanil	931 (2%) Of these, 116 (12%) carfentanil	33 (1%) Of these, 2 (6%) carfentanil
Non-fentanyl synthetic opioids	4 (<1%) all U-47700	4 (<1%) all U-47700	2 (<1%) all U-47700
Benzodiazepines	41 (<1%) Of these, 17 (41%) etizolam	25 (<1%) Of these, 3 (12%) etizolam	2 (<1%) None etizolam
Synthetic cannabinoids	5 (<1%)	3 (<1%)	1 (<1%)
Other commonly detected psychoactive substances	Diphenhydramine: 1,845 (5%) Cocaine: 891 (2%)	Methamphetamine: 891 (2%)	Methamphetamine: 119 (4%) Diphenhydramine: 107 (4%) Cocaine: 53 (2%) MDA: 52 (2%) Benzylpiperazine (BZP): 34 (1%) Ketamine: 32 (1%)
Cutting agents	Caffeine: 16,166 (43%)	Non-opioid analgesics: 4,819 (13%); of these, 4,664 (97%) phenacetin Local anesthetics: ⁶ 4,074 (11%) Caffeine: 2,824 (7%) Levamisole: 1,095 (3%)	Caffeine: 164 (6%) Non-opioid analgesics: 36 (1%); of these, 35 (97%) phenacetin Local anesthetics: 35 (1%) Dimethylsulphone: 33 (1%)

Note: The categories of co-occurring substances are not mutually exclusive and therefore do not add up to the total n.

Among samples seized at Canada’s borders (CBSA data), a similar pattern of co-occurrence emerged:

- Among fentanyl samples, 36% (n = 60/166) included another substance (15 of these [25%] were carfentanil).
- Among cocaine samples, 83% (n = 302/364) included another substance. In 69% of these cases (n = 207/302) the other substance was levamisole. Other cutting agents included phenacetin and caffeine.
- Among methamphetamine samples, 21% (n = 67/324) included another substance, primarily cutting agents such as caffeine and dimethylsulphone.

⁶ Local anesthetics include procaine, lidocaine and benzocaine.



Drug checking data further confirmed frequent discrepancies between the expectations of people using drug checking services and the contents of their drugs. The discrepancies include unexpected additional substances (as reflected in the DAS and CBSA data), as well as drug substitutions or instances where the expected substance was absent.

- Drug checking services in Toronto found that between July and October 2019, 43% of all submitted samples (n = 101/233) contained at least one unexpected noteworthy drug.⁷
- These services also found that only 6% of samples expected to be an opioid (n = 97), 34% of samples expected to be a stimulant (n = 47), and 72% of samples expected to be a psychedelic (n = 71) contained mostly (greater or equal to 75%) the expected substance relative to other substances in the sample (not including non-drug fillers).
- Among samples analysed by B.C. drug checking services between January and July 2019, 11% of samples expected to be opioids (n = 228/2,127), 2% of stimulants (n = 10/571), 23% of depressants (n = 22/94), and 9% of psychedelics (45/518) did not match client expectations.
- At a 2018 festival in B.C., 11% of samples submitted as MDMA and 8% of samples submitted as cocaine did not include the expected drug.
- In Quebec, colorimetric testing at a music festival by Projet Cameleon, for which service users primarily tested MDMA, cocaine, and ketamine, found that 44% of samples analyzed met client expectations and 41% did not.

Finally, survey and urinalysis data from the drug content monitoring study supported the drug checking findings, confirming exposure to substances other than those intended by showing discrepancies between reported drug use and substances appearing in urinalysis.

- In B.C., up to 36% of respondents had positive urine screens for substances they did not report using, suggesting unexpected exposure. Up to 26% had negative urine screens for substances they did report using, meaning they consumed unexpected or inert substances instead.
- In Montreal, findings confirmed adulteration of cocaine with levamisole and local anesthetics, as observed by DAS and CBSA. The most frequent substances people assumed they had consumed in the past three days were crack, cocaine, and speed; the most commonly detected substances in urinalysis were cocaine, levamisole, methamphetamine, and lidocaine. Levamisole and lidocaine detection were associated with reported crack or cocaine use.

Fentanyl and Its Analogues in the Illegal Drug Supply

Key Finding	Fentanyl and its analogues are common in the illegal drug supply		
Supported By	DAS data ✓	Drug content monitoring study	Drug checking
Section Summary	DAS data identified fentanyl or its analogues in nearly two-thirds (62%) of opioid-containing and up to 3% of stimulant-containing samples nationwide. Fentanyl presence was particularly high in B.C., where fentanyl or analogues were present in 91% of opioid-containing samples and up to 10% of stimulant-containing samples (see regional variation section for more detail).		

⁷ A noteworthy drug is defined by the Centre on Drug Policy Evaluation as highly potent, linked to overdose or other adverse effects, or a drug that might not be desired by some clients.



The DAS data in Tables 1a, 1b and 2, along with CBSA and Life Labs urine toxicology data, give some indication of the frequency with which fentanyl and its analogues appear in the drug supply.

- Nationally, nearly two-thirds (62%) of opioid-containing samples analyzed by DAS included fentanyl or its analogues. Carfentanil was the analogue in 14% of these cases.
 - CBSA data showed similar results. Among seized fentanyl samples, 9% (n = 15/166) also contained carfentanil.
 - Data provided by Life Labs in B.C. indicated that among fentanyl-positive urine samples, up to 13.9% also screened positive for carfentanil between February and May 2019.
- Although fentanyl and analogues were most likely to co-occur with other opioids, they co-occurred with stimulants (most often methamphetamine) in up to 3% of cases, in line with previous CCENDU reports (2019).
- In B.C., the presence of fentanyl or its analogues climbed to 91% among opioid-containing samples and up to 10% among stimulant-containing samples (see regional variation section).

Key Finding	Fentanyl and its analogues are not always used intentionally or knowingly		
Supported By	DAS data	Drug content monitoring study ✓	Drug checking ✓
Section Summary	The presence of fentanyl and analogues in the drug supply does not necessarily reflect demand; some of it reflects adulteration. Drug content monitoring (survey and urinalysis) and drug checking data showed that their presence was not always expected: While some survey respondents reported intentionally or knowingly using fentanyl, over one-third (36%) of B.C. respondents with fentanyl-positive urine and over 90% of Montreal respondents with fentanyl-positive urine, did not report using fentanyl; that is, they were unintentionally or unknowingly exposed. Drug checking further revealed fentanyl in drugs thought to be heroin, stimulants and pharmaceuticals. It also revealed unexpected carfentanil and other analogues in drugs thought to be fentanyl.		

Survey and urinalysis data from the drug content monitoring study revealed fentanyl in the urine of people who did not report using it and this lack of awareness can contribute to overdose deaths.

- In B.C., among individuals whose urine tested positive for fentanyl (n = 183/309), only 64% reported using it in the past three days, suggesting over one-third (36%) were unintentionally or unknowingly exposed.
- In Montreal, among the 33 out of 341 individuals whose urine tested positive for fentanyl and analogues, only three reported using it, suggesting over 90% were unintentionally or unknowingly exposed.
- In addition, the presence of carfentanil in urine analyzed by Life Labs in Ontario was detected frequently enough that they deemed it necessary to alert public health authorities. In June 2019, Toronto Public Health released a bulletin on increased carfentanil presence with information provided by the provincial Ministry of Health, which included data from the Chief Coroner for Ontario, showing 142 carfentanil-related deaths in the first four months of 2019 alone, a 50% increase from carfentanil-related deaths in all of 2018 (95 deaths) (Toronto Public Health, 2019a).



Drug checking reports, in line with the survey and urinalysis data, further showed that not all fentanyl is used intentionally or knowingly. Though there was considerable variability in the nature of the reports, all sites reported unexpected fentanyl or analogues in analyzed samples (see Table 3).

Among drug checking services in B.C.:

- 70% of samples submitted as opioids between January and July 2019 were expected to contain fentanyl, yet 88% tested positive for fentanyl, in some cases prompting public health notifications (e.g., fentanyl in counterfeit Percocet™) (Government of B.C., 2019).
- A pilot study conducted in August 2019 confirmed that most samples submitted as “down” contained fentanyl (75%, n = 45/60). The study also consistently detected 4-ANPP, the carcinogenic precursor to fentanyl, suggesting illegal manufacture.
- Fentanyl was also detected in 1% of samples expected to be stimulants (n = 5/571) and 1% of samples expected to be depressants (n = 5/94), prompting further public health notifications (e.g., cocaine containing opioids and in some cases no cocaine, or counterfeit Xanax™ (alprazolam) containing fentanyl or synthetic cannabinoids and in some cases no alprazolam (Government of B.C., 2019).

In Ontario, samples submitted to Oasis as speed or crystal meth between September and December 2018 contained methamphetamine in combination with fentanyl and fentanyl analogues, non-fentanyl synthetic opioids, non-opioid adulterants and cutting agents (see Table 3).

However, detection of fentanyl in stimulants was not consistent across sources.

- Fentanyl immunoassay strips used by ANKORS at a music festival in B.C. showed that of 1,971 samples tested in 2017, 35 samples (1.8%) – primarily thought to be ketamine, MDMA, cocaine or hallucinogens – tested positive for fentanyl. However, at the same festival in 2018, fentanyl strips identified one fentanyl-positive sample of 2,410, and in 2019, 0 of 3,485.
- Consistent with this observation, the August 2019 pilot study in B.C. found no fentanyl in samples submitted as “side, speed, or Crystal,” expected to contain methamphetamine as the primary constituent (n = 29). At the same time, four of these samples also did not contain methamphetamine as the primary constituent.

Other Psychoactive Adulterants Associated with Health Harms

Key Finding	Increasingly, reports also point to unexpected benzodiazepines, non-fentanyl synthetic opioids and synthetic cannabinoids as contributing to health risks		
Supported By	DAS data ✓	Drug content monitoring study	Drug checking ✓
Section Summary	Drug checking consistently found novel synthetic opioids (especially U-47700 and other U-Series compounds), benzodiazepines (especially etizolam, flualprazolam and flubromazolam) and synthetic cannabinoids (especially AMB-FUBINACA). DAS and urine toxicology data confirmed their presence in the drug supply, most often in combination with opioids. These substances are of concern because they are not always detected by test strips and can alter the response to overdose interventions.		

In addition to opioids, other psychoactive adulterants such as benzodiazepines, non-fentanyl synthetic opioids and synthetic cannabinoids are also present in the illegal drug supply and can contribute to health risks. Table 3 shows that drug checking identified a wide variety of adulterants



in samples submitted for analysis. Three categories of substances linked to health risks were consistently reported: non-fentanyl synthetic opioids, benzodiazepines and synthetic cannabinoids.

- In an August 2019 pilot study in B.C., of 15 “down” samples that did not contain fentanyl, nine tested positive for etizolam. Three of the samples contained both etizolam and fentanyl.
- In Ontario, among samples submitted to Oasis as “down,” heroin, or fentanyl between September and December 2018 (n = 56), seven contained fentanyl only; the rest were found to contain various combinations of fentanyl analogues, non-fentanyl synthetic opioids and cutting agents (see Table 3).
- In January 2019, a Toronto Public Health bulletin reported that some drugs sold as fentanyl or heroin in Ontario were causing severe anxiety, memory lapses, erratic behaviour, hallucinations, rapid heart rate and shortness of breath. Analysis of residue from used injection equipment revealed that a synthetic cannabinoid, AMB-FUBINACA, was a major component in addition to fentanyl and heroin (Toronto Public Health, 2019b). Other compounds in the residue included an array of fentanyl analogues, non-opioid adulterants and cutting agents (see Table 3).

DAS, CBSA and urine toxicology data confirmed the presence of these substances in the drug supply.

- Among DAS data, benzodiazepines and synthetic cannabinoids co-occurred with opioids more often than with stimulants (see Tables 1a and 2).
- CBSA noted the appearance of novel synthetic opioids commonly considered adulterants, including U-47700, U-48800 and U-49900, in samples submitted for analysis.
- Life Labs data from B.C. showed increasing etizolam presence among benzodiazepine-positive urine samples between July 2018 and August 2019, as well as flubromazolam presence in 5–10% of all urine samples.
- Life Labs data also indicated that over the course of 2019, among fentanyl-positive urine samples, up to 10% also screened positive for U-47700.

Table 3. Notable findings from Canadian drug checking services⁸

	B.C.	Ontario	Quebec ⁹
Substances identified in drugs thought to be opioids/down	<ul style="list-style-type: none"> • Fentanyl • Carfentanil • 4-ANPP • Synthetic cannabinoids (AMB-FUBINACA) • Etizolam, • Flubromazolam • Dextromethorphan • Common cutting agents: caffeine, sweeteners, vitamin C, polyethylene glycol, noscapine, xylazine • Plaster 	<p>Oasis:</p> <ul style="list-style-type: none"> • Fentanyl, acetylfentanyl, acrylfentanyl, carfentanil, furanylfentanyl • U-47700, U-49900 • Etizolam • Methamphetamine • Diphenhydramine • Cocaine • Methylone • Caffeine <p>Ontario Harm Reduction Network:</p> <ul style="list-style-type: none"> • AMB-FUBINACA • Etizolam • Acetylfentanyl, butyrfentanyl • Codeine 	<ul style="list-style-type: none"> • Fentanyl

⁸ For details on individual drug checking services, see Appendix A.

⁹ The difference in notable results between Quebec and other provinces reflects a difference in available drug checking equipment and not necessarily a difference in adulterants or rates of adulteration.



	B.C.	Ontario	Quebec ⁹
		<ul style="list-style-type: none"> • Ketamine • Methamphetamine • Cocaine, benzocaine • MDMA • Cutting agents: Caffeine, phenacetin, acetaminophen Centre on Drug Policy Evaluation: <ul style="list-style-type: none"> • Fentanyl, 4-ANPP • Heroin, 6-MAM • Morphine • Codeine, acetylcodeine • Benzodiazepine • Cocaine • Cutting agents: Caffeine, phenacetin 	
Substances identified in drugs thought to be stimulants	<ul style="list-style-type: none"> • Fentanyl • Levamisole • Methamphetamine in cocaine • Common cutting agents: caffeine, phenacetin, procaine, benzocaine, creatine, glutamine • Detergent (burning throat when smoked) 	Oasis (expected methamphetamine): <ul style="list-style-type: none"> • Fentanyl, furanylfentanyl, acrylfentanyl • U-47700 • Cocaine • Methylone • 2C-T-7 • Caffeine Oasis (expected cocaine): <ul style="list-style-type: none"> • Fentanyl, furanylfentanyl • U-47700, U-49900 • Codeine • Methamphetamine • Methylone • Levamisole • Caffeine, phenacetin Centre on Drug Policy Evaluation: <ul style="list-style-type: none"> • Cocaine • Benzoylcegonine, ecgonine methyl ester • Methamphetamine • Levamisole • Phenacetin 	Elixir: <ul style="list-style-type: none"> • Methamphetamine in cocaine
Substances identified in other drugs	Found in depressants (including counterfeit Xanax TM): <ul style="list-style-type: none"> • Fentanyl • U-47700 • 5F-ADB • AMB-FUBINACA • Caffeine 	All samples combined: <ul style="list-style-type: none"> • Phenacetin • Carfentanil • Etizolam • Levamisole • AMB-FUBINACA • Flubromazolam • Flualprazolam 	No data available

Note: Because drug checking reporting conventions vary, entries could not be ordered by frequency.



Regional Variation in Availability and Co-occurrence of Substances

Key Finding	There is significant regional variation in supply, demand and co-occurrence of substances		
Supported By	DAS data ✓	Drug content monitoring study ✓	Drug checking
Section Summary	According to the data in this report, there is more fentanyl in the unregulated drug supply in western Canada than in the east. Further, opioids are more often contaminated with other substances in the west than in the east. Stimulant supply and demand are high across the country, but in the east, stimulant availability is significantly higher than that for opioids and stimulants are more often contaminated with other substances than in the west. However, even though DAS detected more substances co-occurring with methamphetamine in the east than in the west, these were mostly cutting agents; in the west they included fentanyl and its analogues.		

There Is More Fentanyl in Western Canada

Among opioid-containing samples analyzed by DAS, the west had the highest presence of fentanyl, its analogues and other, non-opioid substances, whereas the east had the lowest presence of each.

- In B.C., fentanyl and analogues were detected in 91% of opioid-containing samples (n = 5,873/6,475), compared to 62% nationally.
- Comparatively, among opioid-containing samples from the four Atlantic provinces and Quebec, only 8% (n = 55/723) and 14%, (n = 254/1,857), respectively, included fentanyl or its analogues.

These results are consistent with survey data from the drug content monitoring study.

- In B.C., fentanyl was the third-most frequently reported substance consumed in the past three days (reported by 43% of respondents) and the second-most detected in urine (detected in 59% of respondents).
- In contrast, fentanyl was not among the top five most frequently reported or detected substances among Montreal respondents.

There Are More Substances Co-occurring with Opioids in Western Canada

- In B.C., 91% of opioid-containing samples (n = 5,885/6,475) analyzed by DAS also included other, non-opioid substances (including cutting agents), compared 69% nationally. Excluding cutting agents, 15% (n = 985/6,475) included other, non-opioid substances; this concentration was still the highest in the country.
- In contrast, 25% of opioid-containing samples from Quebec (n = 465/1,869) included other, non-opioid substances (7%, n = 132/1,869 without cutting agents).

Stimulants Dominate the Unregulated Drug Market in Eastern Canada

Among stimulant-containing samples analyzed by DAS:

- The greatest number of methamphetamine-containing samples were from Quebec (n = 14,269/37,625 or 38% of all methamphetamine-containing samples seized nationwide).
- The greatest number of cocaine-containing samples were from Ontario (n = 14,329/38,429 or 37% of all cocaine-containing samples nationwide) and Quebec (n = 10,266/38,429 or 27%).



- The DAS data are consistent with survey data from the drug content monitoring study in Montreal, where the top three most frequently reported substances were stimulants: crack (62%), cocaine (41%) and speed/amphetamine (25%).

Among Stimulant-containing Samples, Co-occurring Substances Are More Common in Eastern Canada, but Pose Greater Risk in Western Canada

- In Quebec, 95% of methamphetamine-containing samples analyzed by DAS (n = 13,489/14,269) included another substance, compared to 46% nationally. However, almost all of this amount was accounted for by caffeine and diphenhydramine (an antihistamine), appearing in 93.5% and 12.5% of samples respectively.¹⁰
- In contrast, few methamphetamine-containing samples included other substances in the Prairies and western Canada. In Saskatchewan, co-occurring substances were identified in only 3% of methamphetamine-containing samples (n = 24/758); in Alberta 5% (n = 331/6,518); in Manitoba 14% (n = 151/1,060); and in B.C. 13% (n = 598/4,783).

However, although overall co-occurrence of additional substances in stimulant-containing samples was low in the west, presence of fentanyl and its analogues among these co-occurring substances was highest in B.C.

- In B.C., fentanyl or its analogues were present in 10% of methamphetamine-containing samples (n = 467/4,783) and 7% of cocaine-containing samples (n = 389/5,274). Nationally this proportion was 3% and in Quebec less than 1%.

¹⁰ Note that categories are not mutually exclusive and therefore do not add up to 100%.



Conclusions and Implications

These data demonstrate that the Canadian illegal drug supply is unpredictable. As a result, people who use drugs often do not know what or how much they are consuming, and are accordingly unable to manage their risks. While no drug is risk-free, this unpredictability can dramatically increase the negative health consequences of drug use, especially accidental substance poisoning.

Unexpected Psychoactive Substances and Cutting Agents

Fentanyl and Fentanyl Analogues

Chief among the substances of concern are fentanyl and fentanyl analogues, particularly carfentanil. Carfentanil is stronger and more toxic than fentanyl (Stewart, 2017) and has been linked to a recent spike in overdose deaths. Although many people in some parts of the country have come to intentionally seek out fentanyl or are at least aware that it is likely present, urinalysis and drug checking data indicate that not everyone who uses fentanyl does so intentionally or knowingly. Further, those who do seek fentanyl might be exposed to a more toxic analogue instead. When people do not know what substances they are using or how much, they are at increased risk of accidental poisoning and other harms. This possibility is especially true for people who are not expecting to consume opioids. For example, people expecting to use a stimulant might be opioid naïve or have a low opioid tolerance, and might not be prepared with opioid harm reduction measures (e.g., carrying naloxone).

Benzodiazepines, Synthetic Cannabinoids and Other Opioids

Drug checking and urinalysis sources frequently flagged the appearance of unexpected benzodiazepines, synthetic cannabinoids and non-fentanyl synthetic opioids, particularly in combination with other opioids. This finding raises two concerns:

1. These substances are not always detected by drug checking technologies, such as immunoassay test strips, which might mean that individuals who have their drugs checked might misinterpret their results as indicating that their drugs have not been adulterated.
2. The presence of benzodiazepines, synthetic cannabinoids and non-fentanyl synthetic opioids can result in medical emergencies that present with less typical and more complex symptoms and do not always respond as expected to naloxone. For example, because benzodiazepines are depressants, they can intensify opioid effects like slowed breathing, but benzodiazepine effects can not be reversed by naloxone.

Cutting Agents

Based on the data sources available, up to 91% of drugs can contain adulterants. The majority of these are cutting agents, whose presence poses two main health risks:

1. The presence and quantity vary from one batch of drugs to another and can influence the concentration of the expected psychoactive substance in the drug, making it unpredictable.
2. Some have been associated with negative health consequences themselves. For example, levamisole, which consistently appears in cocaine, has been linked to blood and vascular pathologies causing tissue necrosis (Brunt et al., 2017); phenacetin, which was found in opioids and stimulants, has been linked to cancer and kidney disease (Carcinogenic Potency Project, 2007); and added detergent burned the throats of people who inadvertently smoked it. This suggests that cutting agents contribute to the health risks created by an unpredictable supply.



Regional Variation in Supply, Demand and Substance Co-occurrence

Another noteworthy finding is that drug supply and substance co-occurrence patterns differed greatly between eastern and western Canada. There appears to be more fentanyl in western Canada than in the east, while stimulants dominate the illegal drug market in eastern Canada. Substance co-occurrence patterns also differed by region, affecting the opioid supply more in the west and the stimulant supply more in the east. However, in B.C., fentanyl presence was the highest in both opioids and stimulants, suggesting adulteration across the supply in this province.

While it is suspected that some of these differences stem from different supply routes and distribution networks across the country (e.g., the vast majority of fentanyl is thought to originate in China, making B.C. the nearest port of entry), more research is needed to determine the reasons for this regional variation.

Implications and Next Steps

Based on the findings from this report, the following actions could be considered going forward.

Investing in the collection and dissemination of better quality and more timely data on substances in the unregulated drug supply in Canada should be a priority. This investment could be made through developing a Canadian drug observatory service, which would:

- Monitor the contents of the drug supply over time to detect the appearance of, or changes in, adulterants and contaminants, track any adverse health effects, and share these results in a timely fashion;
- Work with drug checking programs to standardize drug checking data so that it can better inform drug market monitoring efforts and allow for regional comparability;
- Centralize public health alerts into a publicly accessible database so that jurisdictions can readily access and share information; and
- Raise public awareness of the link between lack of quality control in the unregulated drug market and health risks, particularly accidental substance poisoning.

The capacity of harm reduction services could be developed, and access to them improved, including:

- Investing in dissemination of targeted, fact-based, and non-judgmental information to ensure that people who use drugs are aware of potential contaminants, ways to reduce risks (e.g., using harm reduction services, not using alone), and ways to identify and intervene in an overdose.
- Supporting the development and sustainability of low-barrier, easily accessible harm reduction services such as drug checking and supervised consumption services, and expanding them to different regions across the country, to provide a national picture and tailor responses to each region's particular drug use and adulteration patterns;
- Continuing to encourage first responders and others to carry naloxone and be trained on appropriate overdose response protocols, including updated protocols focused on inadvertent use of multiple substances; and
- Increasing investment in a range of treatment options to ensure that people who use drugs and those with a substance use disorder receive the needed services.

Approaches that can decrease drug-related harms by increasing the predictability of drug contents should be advanced. Such approaches include “safer supply” programs such as injectable opioid



agonist treatment (e.g., hydromorphone or diacetylmorphine) (Fairbairn et al., 2019) and low-barrier opioid distribution programs (Tyndall, 2018). As the evidence around some of these approaches is limited, next steps could include:

- Synthesizing the available evidence to identify research gaps and formulating recommendations to address them;
- Exploring and evaluating various models of delivery of such interventions to produce evidence-informed recommendations for program development, scale-up and sustainability;
- Evaluating context variables to assess what works best, for whom and why, as well as evaluating the long-term safety and efficacy of these interventions;
- Investigating the feasibility of applying a similar approach to non-opioid drugs, in light of our finding that contamination is widespread across the drug supply and that there is increased methamphetamine use across the country. Proposals for stimulant substitution or distribution programs have been put forward (Canadian Association of People Who Use Drugs, 2019; Fleming, Barker, Ivsins, Vakharia, & McNeil, 2020) and could be piloted and evaluated; and
- Analyzing the regulatory and policy barriers that need to be addressed, and employing the policy levers and facilitators that are available, to enable the development, scale-up and stability of successful interventions beyond the pilot phase.

It will also be important to monitor and assess whether large scale social changes resulting from the COVID-19 pandemic will influence the illegal drug supply (e.g., disruption of local distribution networks due to self-isolation) and level of contamination in the drug supply.



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Appendix A: Data Sources

Source	Details	Limitations	Time Frame
Samples Seized by Law Enforcement			
Health Canada's Drug Analysis Service (DAS)¹¹	In April 2018, Health Canada's DAS laboratory began sharing with partners the results of analyses of seized controlled drugs. The database lists all substances contained in each sample submitted for analysis, providing an assessment of drug constituents by region.	The database does not include information on: <ol style="list-style-type: none"> 1. Quantities of each substance; 2. Which substances were expected by the buyer or seller; 3. Where in each province the sample was seized; or 4. Under what circumstances samples were seized (e.g., small amounts from individuals vs. large amounts). The database is limited to samples submitted for analysis and so might not be representative of all substances seized in Canada or all drugs circulating on the market.	The bulletin includes DAS data from April 2018 to August 2019
Canadian Border Services Agency (CBSA)	CBSA analyzes the contents of select samples seized at Canadian ports of entry. CBSA provided results of fentanyl, methamphetamine and cocaine seizures.	Though these samples provide a useful snapshot of the constituents of controlled substances seized at Canadian ports of entry, they do not represent the full drug import and export picture as not all suspected drugs detained at the border are sent to the CBSA laboratory for analysis.	The bulletin includes CBSA data from 2017 to July 2019
Drug Checking Data			
Drug Checking Working Group (DCWG)	The DCWG is a collection of drug checking service providers, researchers and policy makers from across the country. Drug checking services provide information on the contents of samples along with information on service users' expectations. DCWG members from British Columbia, ¹² Ontario ¹³ and Quebec ¹⁴ provided information for this bulletin.	Services use a variety of technologies and protocols for collecting and reporting data (see Centre on Drug Policy Evaluation, 2018; Kerr & Tupper, 2017, for further detail on limitations of each).	Reporting timeframes vary, but span 2018 and 2019, as noted in the text

11 Results presented here are based on monthly raw data shared by DAS. However, for ease of reporting in this bulletin, substances are classified differently from DAS reports, in which the system of reporting is based on the *Controlled Drugs and Substances Act* drug schedules and items.

12 Drug checking in B.C. is supported by a partnership between the [B.C. Centre on Substance Use](#) and regional health authorities (Vancouver Coastal Health, Interior Health and Fraser Health), offering Fourier-transform infrared spectrometry (FTIR) and fentanyl immunoassay strips at supervised consumption and overdose prevention sites, music festivals and pop-up events. Drug checking results are entered into a common database and reports are released monthly. Public health notifications (e.g., via the Real-time Drug Alert and Response [RADAR] network) are additionally released as needed. The [AIDS Network Kootenay Outreach and Support Society](#) (ANKORS) further provides drug checking services at music festivals. A pilot trial of paper-spray mass spectrometry (PS-MS) was added to services at a harm reduction site in Vancouver in August 2019, providing clients with rapid identification and quantification of substances onsite. This pilot test was part of the [Health Canada Drug Checking Technology Challenge](#).

13 The [Centre on Drug Policy Evaluation](#) is leading a multi-site drug checking services pilot project in Toronto in partnership with three frontline harm reduction agencies and two clinical laboratories using gas chromatography and liquid chromatography-mass spectrometry (GC-MS, LC-MS). In addition, the [Ontario Harm Reduction Network](#) releases bulletins on issues of concern to harm reduction workers and people who use drugs. The Sandy Hill Community Health Centre's [Oasis](#) Program in Ottawa provides drug checking services using mass spectrometry to clients of its supervised injection site.

14 There are currently no organizations in Quebec that operate a drug checking device. In Montreal, fentanyl immunoassay strips are used at the four supervised consumption sites in Montreal and distributed by 14 community-based harm reduction organizations and three organizations in the health network (provided by Direction régionale de santé publique de Montréal). [Élixir](#), a community organization based in Sherbrooke, also provides colorimetric drug checking at music festivals and events.



Source	Details	Limitations	Time Frame
Urine Toxicology Data			
Drug content monitoring study (survey and urinalysis)	<p>Research teams in B.C. (B.C. Centre for Disease Control) and Montreal (Centre intégré universitaire de santé et de services sociaux du Centre-Sud-de-l'Île-de-Montréal) recently completed a pilot project with clients accessing harm reduction services. They were able to compare survey responses indicating which substances clients think they took to urinalysis results revealing what they actually took.</p> <p>The B.C. pilot included data from 486 clients from 27 harm reduction sites, 309 of whom provided urine samples for analysis. Urine toxicology was performed by Life Labs.</p> <p>The Montreal pilot collected surveys and urine of 341 people in partnership with 10 community and institutional partners. Urine toxicology was performed by the toxicology centre of the Institut national de santé publique du Québec.</p>	<p>The studies use convenience samples and rely on self-reported behaviours. Reported drug use on the survey covers the past three days, but some substances disappear from urine faster than that, while others stay longer.</p>	<p>Data were collected between May and August 2018 in B.C. and between August and September 2018 in Montreal</p>
Life Labs	<p>Life Labs is a commercial laboratory that operates in B.C. and Ontario, performing urine toxicology to indicate recent exposure to specific substances. Life Labs provided additional aggregated data from clients who contract with them (e.g., outpatient clinics).</p>	<p>Unless linked to survey data, it is not possible to determine what substances were intended to be used or whether detected substances co-occurred or were taken separately.</p>	<p>This bulletin uses data released in August 2019, reporting on the previous 26 weeks</p>