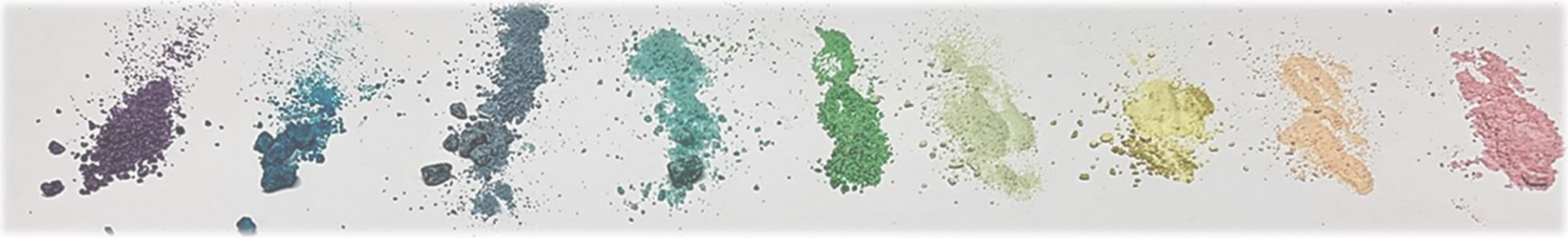
IN FOCUS: THE EMERGENCE OF OPIOIDS IN CANADA



HEALTH CANADA
DRUG ANALYSIS SERVICE

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Health Canada's Drug Analysis Service (DAS) operates laboratories across Canada that analyze illicit drugs and substances submitted by Canadian law enforcement and public health officials. DAS data is based solely on samples submitted to the laboratories and as such, samples analyzed by DAS may not be completely representative of drug seizures in Canada, including substances circulating on the market. DAS data should therefore be used with caution when determining trends or drawing conclusions about the type and nature of substances circulating in the illicit market. The data in this report represents the number of times a substance was identified in samples submitted to DAS. A single sample may contain more than one substance.

Summary

- Since 2012, the Drug Analysis Service (DAS) has consistently identified Fentanyl, Heroin, Hydromorphone, Oxycodone, and Morphine as the most frequently encountered opioids in samples submitted by Canadian law enforcement and public health officials.
- In 2017, Fentanyl replaced Heroin as the most frequently identified opioid.
- As the prevalence of Fentanyl has increased over the years, the co-occurrence patterns have also evolved. In 2021, benzodiazepines became the most frequently observed co-occurring substances with Fentanyl, found in approximately 36% of samples containing Fentanyl. Methamphetamine has been increasingly found alongside Fentanyl. Lastly, new and emerging substances of concern, Xylazine and nitazenes, have consistently co-occurred with Fentanyl and Fentanyl analogues.
- Recently, a Fentanyl analogue, para-Fluorofentanyl was the second most frequently identified opioid after Fentanyl in samples analyzed by DAS in 2023.
- Prior to 2023, Fentanyl identifications were ten times higher than those of Fentanyl analogues. However, the rise of para-Fluorofentanyl in 2023 has lowered this ratio with Fentanyl identifications being approximately 2 times higher than Fentanyl analogue identifications. In 2021 and 2022, Carfentanil and para-Fluorofentanyl were the most frequently identified Fentanyl analogues, with para-Fluorofentanyl being the most common in 2023. These analogues were predominantly found in co-occurrence with Fentanyl and, in recent years, sometimes alongside benzodiazepines.

In Focus: The Emergence of Opioids in Canada

Context: The Overdose Crisis in Canada

Canada is currently facing an opioid crisis stemming from the abuse of both illegal and prescription opioids. Opioids are substances that can reduce pain. Research indicates that the escalation of the overdose crisis in Canada can be partly attributed to the growth in use of prescription opioids in recent decades, subsequently leading to an increase in reported harms associated with their use. Additionally, there has been a surge in the consumption of non-prescription opioids. The COVID-19 pandemic has further exacerbated the situation. Recognizing the urgency of this crisis, the Government of Canada has made substantial investments in harm reduction, introducing various initiatives aimed at preventing opioid-related harms and reducing the excessive prescription of opioids [1] [2].

Recent data reveals that from all accidental apparent opioid toxicity deaths in 2023, 88% of deaths were linked to non-pharmaceutical opioids, and 82% of these deaths involved Fentanyl [3].

In Canada, a total of 44,592 fatalities due to apparent opioid toxicity were recorded from January 2016 to December 2023. 2023 witnessed an alarming average of 22 deaths per day. In comparison, the number of deaths per day was approximately 8 in 2016 and 12 in 2018, underscoring a significant increase over recent years. The evolving toxicity of the opioid supply in Canada stands as a major contributing factor to the devastating rise in opioid-related deaths [3].

Aim

This In Focus report outlines the trends observed in the opioid supply in Canada since 2012 based on samples submitted to the DAS by law enforcement and public health officials. Specifically, it aims to characterize trends related to opioids, and particularly, patterns observed in co-occurrences with Fentanyl, including with benzodiazepines, Heroin, Fentanyl analogues, and multiple drug classes.

Data limitations

This report is based on data made available by the DAS, which analyzes illicit drugs and substances submitted by Canadian law enforcement and public health officials. Certain limitations are associated with the present data. Firstly, law enforcement officials submit samples for laboratory analysis based on investigation needs and priorities. Thus, analyzed samples may not be completely representative of substances circulating on the market as a number of factors may influence substances submitted by Canadian law enforcement officials. Additionally, DAS' mandate is to report substances that are controlled under the Controlled Drugs and Substances Act (CDSA). As such, it is possible that not all noncontrolled substance were reported.

DATA ANALYSIS

Results of analyzed samples submitted by Canadian law enforcement and public health officials are reported in a centralized database called the Laboratory Information Management System (LIMS). The presented data were retrieved from the LIMS and cover the period between January 1, 2012, and December 31, 2023, inclusively.

Identifications refer to the number of times a substance is identified in samples submitted. Multiple substances may be identified in a single sample. For example, a sample containing Fentanyl, Morphine, and Isotonitazene would be interpreted as one identification of Fentanyl, one identification of Morphine, and one identification of Isotonitazene. Therefore, the number of identifications does not necessarily equal the number of samples.

For the purposes of this report, we have categorized opioids into 4 distinct subclasses:

Fentanyl & Analogues: This subclass includes Fentanyl, its derivatives, and other analogues, all of which are controlled under Schedule I Item 16 of the CDSA.

Opiates: This subclass comprises opium or opium derivatives derived from the poppy plant, as well as compounds that have the core chemical structure of morphine. Drugs falling under this subclass are controlled under Schedule I Item 1 and 10 of the CDSA.

Nitazenes: This subclass includes all nitazenes controlled under Schedule I, Item 13 of the CDSA, excluding Brorphine (classified in *Other (Opioids)*). Nitazenes are potent synthetic opioids.

Other opioids: This subclass encompasses all other synthetic opioids that share similar properties with *Fentanyl & Analogues*, *Opiates*, and *Nitazenes.* Drugs under this subclass are controlled under Schedule I, Item 3, 4, 5, 6, 7, 8, 9, 11, 12, 17, 22, 23, 24, 25, 26, 27. Some substances in this subclass are also not controlled.

The analysis of data presented was performed in R 4.2.3. Data wrangling and visualization was done using the *tidyverse package* [4].

OPIOID DRUG SUPPLY IN CANADA

Opioids are potent analgesic drugs used for pain relief. Due to their capacity to induce euphoria (a sense of being high), opioids carry a significant risk for problematic use. The prolonged use of opioids can lead to severe side effects, including physical dependence, substance use disorder, and overdose [5]. Naloxone, a fast-acting medication, can be administered to temporarily reverse the effects of an overdose from opioid use [6]. The sale, possession and production of opioids are illegal, unless authorized for medical, scientific or industrial purposes. They are controlled under Schedule I of the *CDSA* [7].

Most frequently identified opioids

The most frequently identified opioids by DAS in samples submitted by Canadian law enforcement and public health officials in 2023 are Fentanyl, para-Fluorofentanyl, Hydromorphone, Oxycodone, and Heroin (Figure 1, Table 1) [8]. In 2017, Fentanyl emerged as the primary opioid in the Canadian drug supply, surpassing Heroin (Figure 1). Fentanyl is a potent opioid used in medical settings for pain management. Illicit Fentanyl can be mixed with other substances to increase the potency of the product, which increases the risk of an accidental overdose [9].

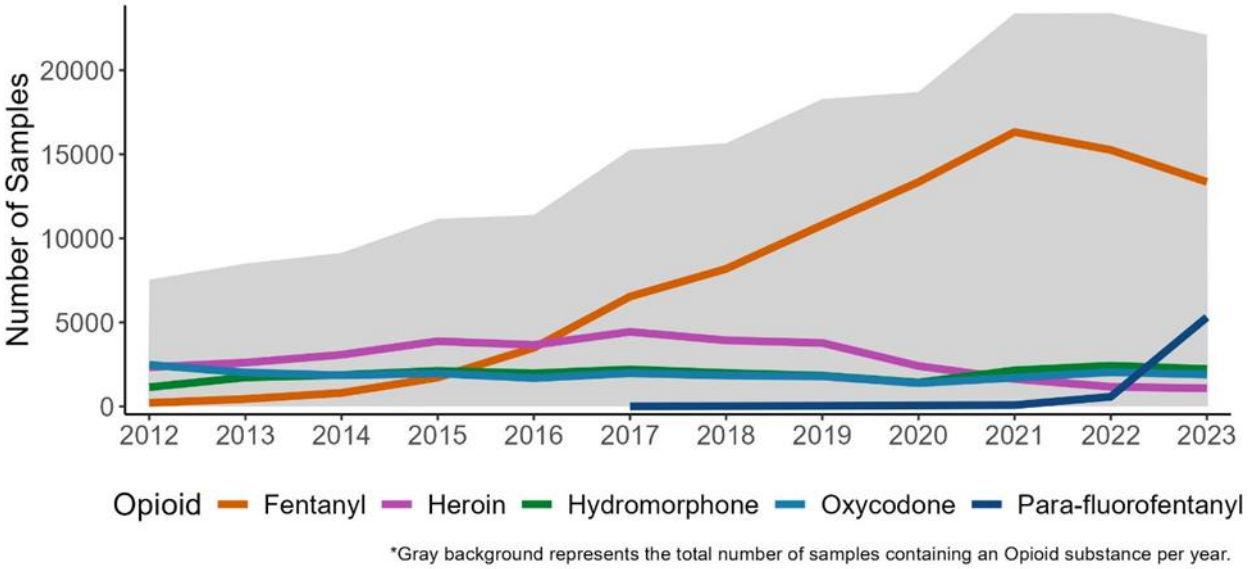


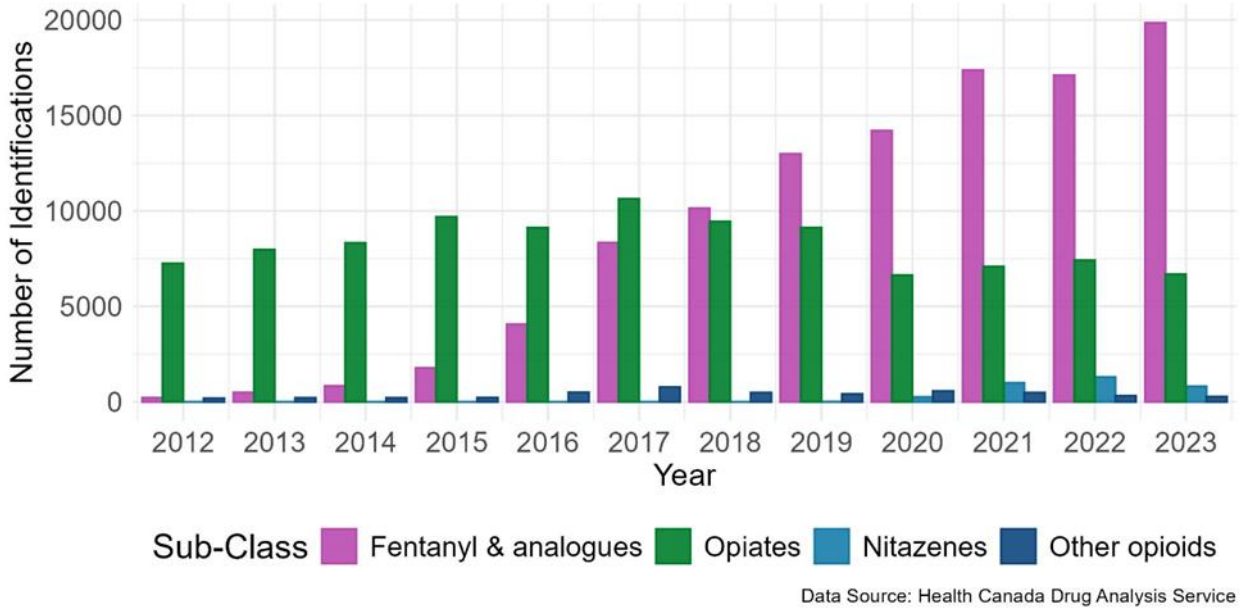
Figure 1: Most frequently identified opioids in samples submitted and analyzed by DAS in 2023 over time

Table 1: Most frequently identified opioids in samples submitted to DAS for analysis in 2023

Opioid	Subclass	General Information	Therapeutic Uses
Fentanyl	Fentanyl & Analogues	Fentanyl is a synthetic opioid, 50 to 100 times more potent than morphine, and has played a significant role in the Canadian overdose crisis [9].	It is prescribed to manage severe pain, particularly after surgical procedures [9].
para-Fluorofentanyl	Fentanyl & Analogues	Para-Fluorofentanyl is a synthetic opioid. It is a Fentanyl analogue. There is little information in the literature concerning its potency, but it is likely similar to Fentanyl [10].	Para-Fluorofentanyl is not a prescription medicine and has no approved therapeutic use.
Hydromorphone	Opiates	Hydromorphone is a semi-synthetic opioid that can be synthesized from Morphine, a minor constituent of opium [11]. It is approximately 5 times more potent than morphine [12].	Hydromorphone is indicated for the relief of moderate to severe pain [11].
Oxycodone	Opiates	Oxycodone is a semi-synthetic opioid derived from Thebaine (a minor constituent of opium) [11]. It is 1.5 times more potent than morphine [12].	Oxycodone is indicated for the management of moderate to severe pain [11].
Heroin	Opiates	Heroin is a semi-synthetic opioid derived from morphine. It is 2 to 4 times more potent than morphine and is primarily used as an illegal recreational substance [13].	Under medical supervision, prescriptions for Heroin may be obtained through the Urgent Public Health Need process for treating problematic opioid use [14].

Trends in the opioid-related drug supply

Trends are represented by way of identifications (see ''Data analysis'' section).
Opiates, specifically Heroin, Oxycodone, and Hydromorphone, were the most commonly identified opioids in the illicit drug supply in Canada until 2016.
By 2018, Fentanyl and its analogues had surpassed all other opioid subclasses combined in the number of identifications, becoming the dominant subclass of opioids identified and displacing the opiates subclass. Fentanyl analogues are substances chemically similar to Fentanyl. Often manufactured by modifying the chemical structure of Fentanyl, they have a high potential for misuse and dependence. [15]
Since 2020, Heroin identifications have notably decline, and there has been an emerging presence of non-Fentanyl and non-opiate opioids, specifically nitazenes. Nitazenes are potent synthetic opioids only present in the illicit drug supply. Certain nitazenes are estimated to have greater potencies than Fentanyl [16].
Overall, trends observed in Canada in the past decade indicate a shift in the opioid supply towards more potent substances (Figure 2, Table 2).



Note: Samples may contain multiple substances and other substances than those listed.

Figure 2. Number of opioid identifications per subclass and year in Canada (2012 to 2023)

Table 2. Number of opioid identifications per class and year in Canada (2012 to 2023)

Substance	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Fentanyl & analogues													
Acetylfentanyl	-	48	29	45	232	138	51	111	404	16	35	40	**1149**
Carfentanil	-	-	-	-	32	740	977	1766	312	890	1116	810	**6643**
Cyclopropylfentanyl	-	-	-	-	-	199	328	106	36	5	-	6	**680**
Fentanyl	217	446	809	1721	3491	6538	8187	10795	13349	16325	15260	13359	**90497**
Furanylfentanyl	-	-	-	-	164	637	278	78	47	12	10	7	**1233**
para-Fluorofentanyl	-	-	-	-	-	4	-	-	-	83	582	5309	**5978**
Other - Fentanyl & Analogues	-	-	-	15	139	89	318	134	52	34	105	321	**1207**
Total - Fentanyl & Analogues	**217**	**494**	**838**	**1781**	**4058**	**8345**	**10139**	**12990**	**14200**	**17365**	**17108**	**19852**	**107387**
Nitazenes													
Etodesnitazene	-	-	-	-	-	-	-	-	84	255	145	21	**505**
Isotonitazene	-	-	-	-	-	-	-	8	166	176	251	31	**632**
Metonitazene	-	-	-	-	-	-	-	-	-	342	346	334	**1022**
N-pyrrolidino Protonitazene	-	-	-	-	-	-	-	-	-	-	-	25	**25**
N-desethyl Isotonitazene	-	-	-	-	-	-	-	-	-	-	-	69	**69**
Protonitazene	-	-	-	-	-	-	-	-	-	171	415	302	**888**
Other - Nitazenes	-	-	-	-	-	-	-	-	-	46	144	21	**305**
Total - Nitazenes	-	-	-	-	-	-	-	**8**	**250**	**990**	**1301**	**803**	**3352**
Opiates													
6-Acetylmorphine	28	18	27	58	39	34	37	66	139	57	78	62	**643**
Buprenorphine	28	33	77	127	185	272	301	337	324	360	359	248	**2651**
Codeine	482	529	541	671	696	757	568	571	383	404	367	367	**6336**
Heroin	2339	2609	3079	3883	3664	4443	3935	3781	2408	1636	1174	1081	**34032**
Hydromorphone	1149	1730	1877	2121	1972	2203	1991	1835	1427	2151	2426	2230	**23112**
Morphine	620	836	700	734	739	811	657	633	425	574	723	578	**8030**
Opium	105	176	151	104	129	126	98	85	111	166	211	192	**1654**
Oxycodone	2477	2021	1857	1970	1690	1983	1843	1797	1390	1717	2045	1901	**22691**
Other - Opiates	37	17	14	34	35	22	27	28	40	29	31	29	**343**
Total - Opiates	**7265**	**7969**	**8323**	**9702**	**9149**	**10651**	**9457**	**9133**	**6647**	**7094**	**7414**	**6688**	**99492**
Other opioids													
Furanyl UF-17	-	-	-	-	-	-	-	37	258	218	100	38	**651**
Methadone	110	137	112	145	154	168	136	106	131	117	82	129	**1527**
Tramadol	46	24	49	45	103	101	52	112	86	78	69	71	**836**
U-47700	-	-	-	-	208	451	228	92	27	1	1	1	**1009**
Other – Other (opioids)	30	46	48	39	81	122	94	80	76	76	80	35	**807**
Total - Other (opioids)	**186**	**207**	**209**	**229**	**546**	**842**	**510**	**427**	**578**	**490**	**332**	**274**	**4830**

Note: Samples may contain multiple substances and other substances than those listed.

Trends in the opioid-related drug supply (continued)

Opiates continue to dominate as the most prevalent substances in the eastern provinces (Maritimes and Quebec). In 2023, the eastern provinces had higher proportions of opiates, while the rest of the country had a higher proportion of Fentanyl and Fentanyl analogue identifications (Figure 3).

Sample forms in the opioid-related drug supply

The form of analyzed substances differs by opioid type. Fentanyl and analogue-class opioids have a high proportion of samples in powder form. In contrast, opiate-class opioids are more frequently found in tablet/capsule form (Figure 4, Table 3).

The most common form of opioid samples found varies geographically, with Eastern provinces generally exhibiting fewer powder form samples of each opioid class, whereas Western provinces having a higher proportion of samples in powder form across all opioid classes compared to the Eastern provinces (Figure 4, Table 3).

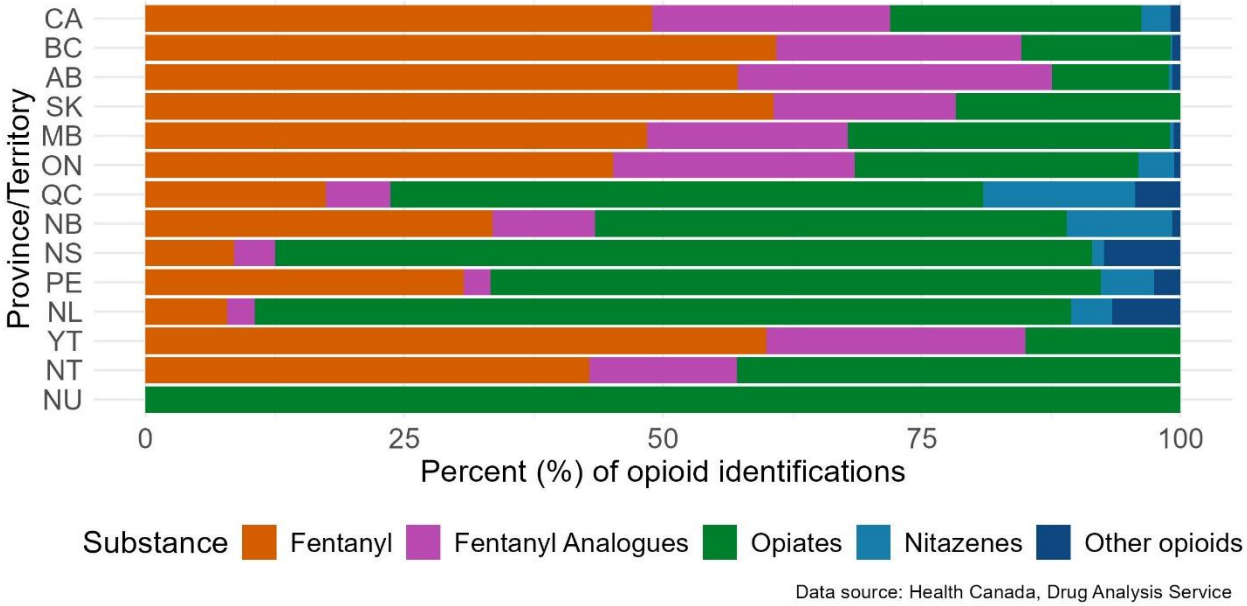


Figure 3. Percentage of opioid identifications by subclass and by Province/Territory in 2023

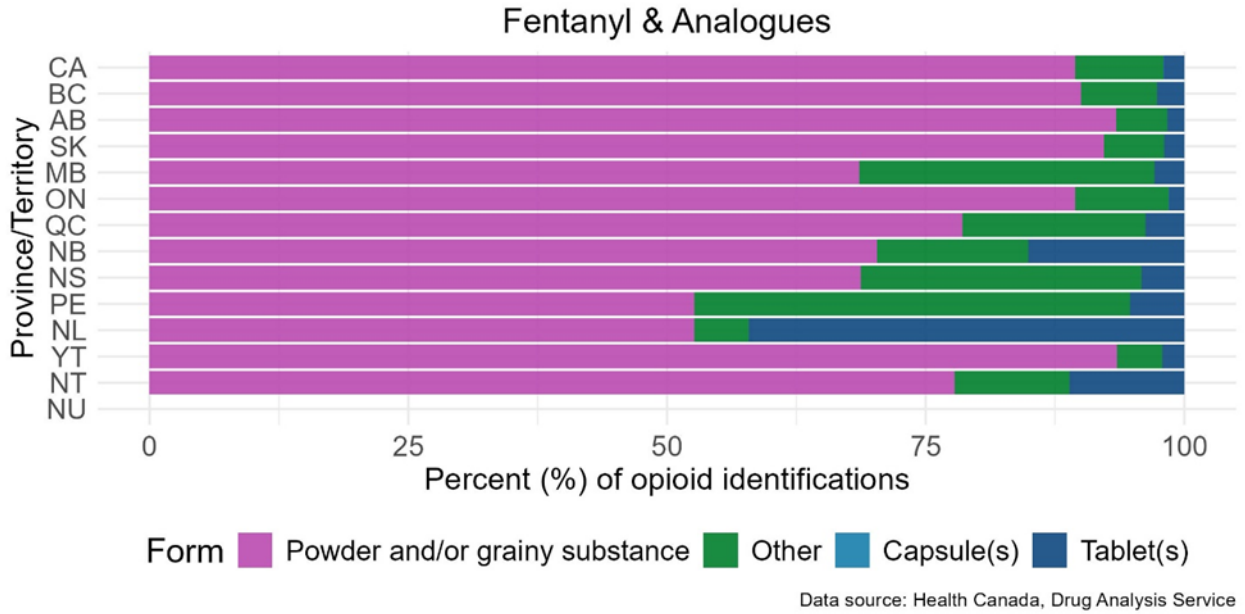


Figure 4. Percentage of opioid identifications by subclass and form per Province/Territory for 2021 – 2023 a) Fentanyl and analogues

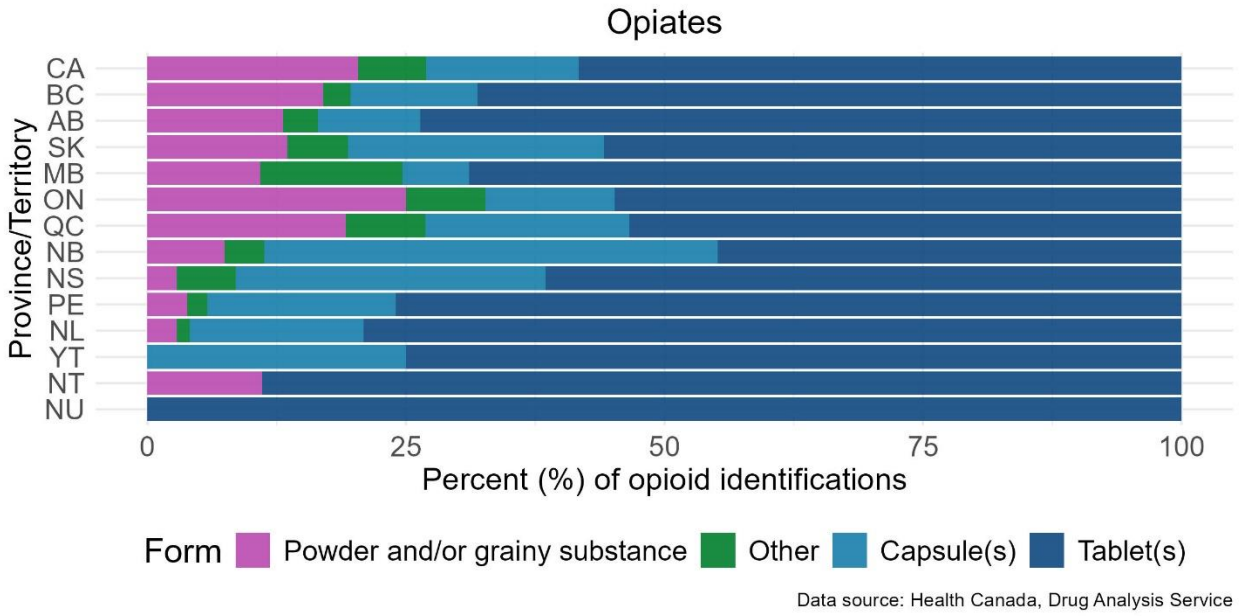


Figure 4. b) Opiates

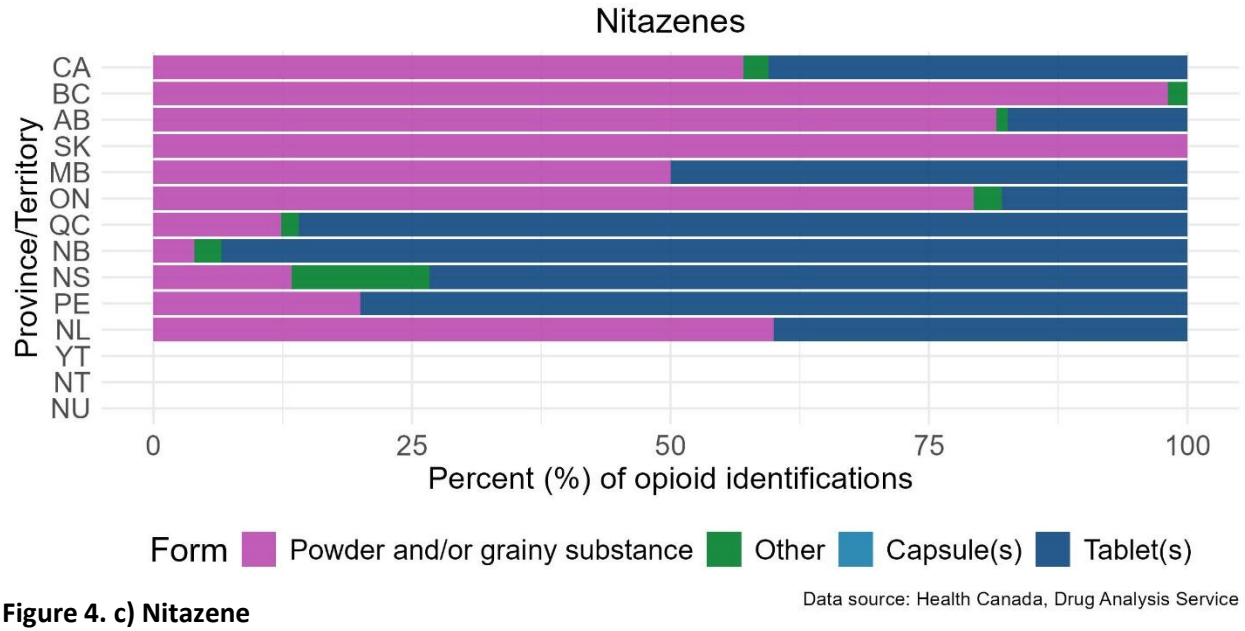


Figure 4. c) Nitazene

Note: No nitazene samples were identified in Yukon, Northwest Territories, or Nunavut for 2021-2023.

Note: The subclass ''other opioids'' was not included in this figure in order to focus on the most frequently analyzed subclasses.

Table 3. Percentage of opioid identifications by subclass and form per Province/Territory for 2021 – 2023

a) Fentanyl and analogues

Province	Fentanyl & analogues				
	Capsule(s)	Powder and/or grainy substance	Tablet(s)	Other	Total
Canada	13 (0.0%)	42,315 (89.4%)	948 (2.0%)	4,041 (8.5%)	**47,317**
British Columbia	1 (0.0%)	11,194 (90.0%)	331 (2.7%)	910 (7.3%)	**12,436**
Alberta	1 (0.0%)	7,605 (93.4%)	134 (1.7%)	402 (4.9%)	**8,142**
Saskatchewan	-	427 (92.2%)	9 (1.9%)	27 (5.8%)	**463**
Manitoba	-	777 (68.6%)	33 (2.9%)	323 (28.5%)	**1,133**
Ontario	11 (0.1%)	21,269 (89.4%)	355 (1.5%)	2,145 (9.0%)	**23,780**
Quebec	-	772 (78.5%)	37 (3.8%)	174 (17.7%)	**983**
New Brunswick	-	168 (70.3%)	36 (15.1%)	35 (14.6%)	**239**
Nova Scotia	-	33 (68.8%)	2 (4.2%)	13 (27.1%)	**48**
Prince Edward Island	-	10 (52.6%)	1 (5.3%)	8 (42.1%)	**19**
Newfoundland and Labrador	-	10 (52.6%)	8 (42.1%)	1 (5.3%)	**19**
Yukon	-	43 (93.5%)	1 (2.2%)	2 (4.4%)	**46**
Northwest Territories	-	7 (77.8%)	1 (11.1%)	1 (11.1%)	**9**
Nunavut	-	-	-	-	**-**

b) Opiates

Province	Opiates				
	Capsule(s)	Powder and/or grainy substance	Tablet(s)	Other	Total
Canada	3,114 (14.8%)	4,294 (20.4%)	12,285 (58.3%)	1,388 (6.6%)	**21,081**
British Columbia	310 (12.3%)	429 (17.0%)	1,721 (68.1%)	68 (2.7%)	**2,528**
Alberta	168 (10.0)	221 (13.1%)	1,244 (73.6%)	57 (3.4%)	**1,690**
Saskatchewan	55 (24.8%)	30 (13.5%)	124 (55.9%)	13 (5.9%)	**222**
Manitoba	36 (6.4%)	61 (10.9%)	385 (68.9%)	77 (13.8%)	**559**
Ontario	1,458 (12.5%)	2,913 (25.0%)	6,373 (54.8%)	889 (7.6%)	**11,633**
Quebec	576 (19.7%)	561 (19.2%)	1,562 (53.4%)	227 (7.8%)	**2,926**
New Brunswick	323 (43.9%)	55 (7.5%)	330 (44.8%)	28 (3.8%)	**736**
Nova Scotia	126 (29.9%)	12 (2.9%)	259 (61.5%)	24 (5.7%)	**421**
Prince Edward Island	19 (18.3%)	4 (3.9%)	79 (76.0%)	2 (1.9%)	**104**
Newfoundland and Labrador	41 (16.8%)	7 (2.9%)	193 (79.1%)	3 (1.2%)	**244**
Yukon	2 (25.0%)	-	6 (75.0%)	-	**8**
Northwest Territories	-	1 (11.1%)	8 (89.0%)	-	**9**
Nunavut	-	-	1 (100.0%)	-	**1**

Table 3. Percentage of opioid identifications by subclass and form per Province/Territory for 2021 – 2023

c) Nitazenes

Province	Nitazenes				
	Capsule(s)	Powder and/or grainy substance	Tablet(s)	Other	Total
Canada	-	1,608 (57.1%)	1,141 (40.5%)	68 (2.4%)	**2,817**
British Columbia	-	52 (98.1%)	-	1 (1.9%)	**53**
Alberta	-	75 (81.5%)	16 (17.4%)	1 (1.1%)	**92**
Saskatchewan	-	10 (100.0%)	-	-	**10**
Manitoba	-	3 (50.0%)	3 (50.0%)	-	**6**
Ontario	-	1,362 (79.3%)	308 (17.9%)	47 (2.7%)	**1,717**
Quebec	-	94 (12.3%)	655 (86.0%)	13 (1.7%)	**762**
New Brunswick	-	6 (4.0%)	142 (93.4%)	4 (2.6%)	**152**
Nova Scotia	-	2 (13.3%)	11 (73.3%)	2 (13.3%)	**15**
Prince Edward Island	-	1 (20.0%)	4 (80.0%)	-	**5**
Newfoundland and Labrador	-	3 (60.0%)	2 (40.0%)	-	**5**
Yukon	-	-	-	-	**-**
Northwest Territories	-	-	-	-	**-**
Nunavut	-	-	-	-	**-**

Note: No nitazene samples were identified in Yukon, Northwest Territories, or Nunavut for 2021-2023.
Note: The subclass ''other opioids'' was not included in this figure in order to focus on the most frequently analyzed subclasses.

Sample forms in the opioid-related drug supply (continued)

Opioid samples in powder form often contain a greater variety of substances than those in tablet or capsule forms. This is especially true in recent years, where the proportion of the number of co-occurring substances has increased in powered samples (Figure 5).

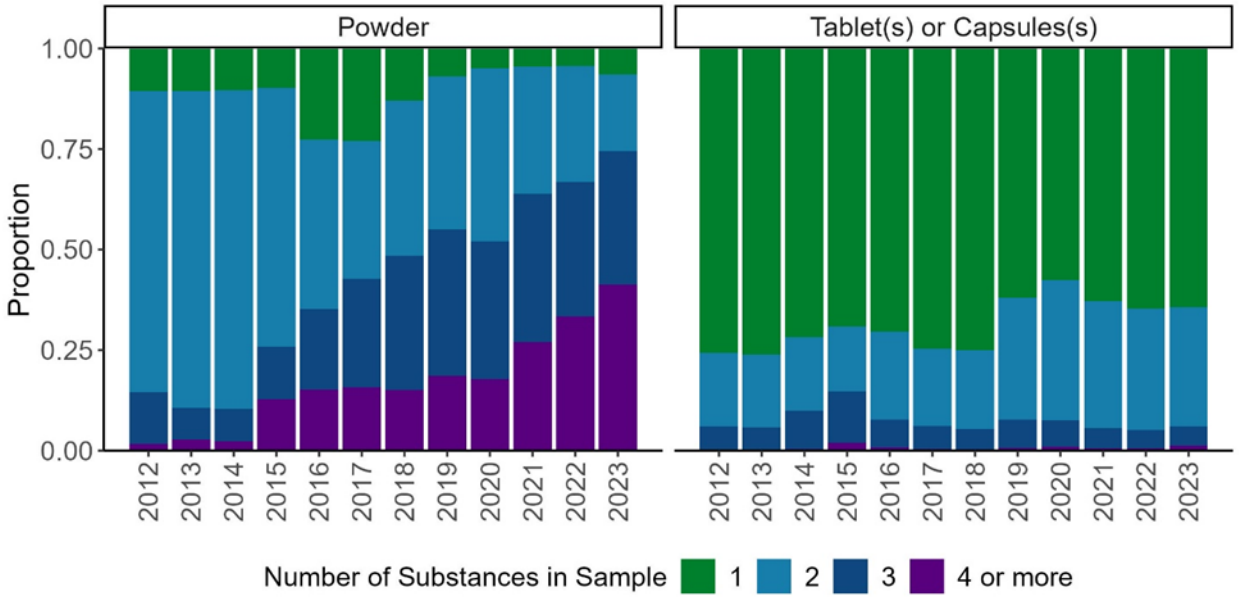


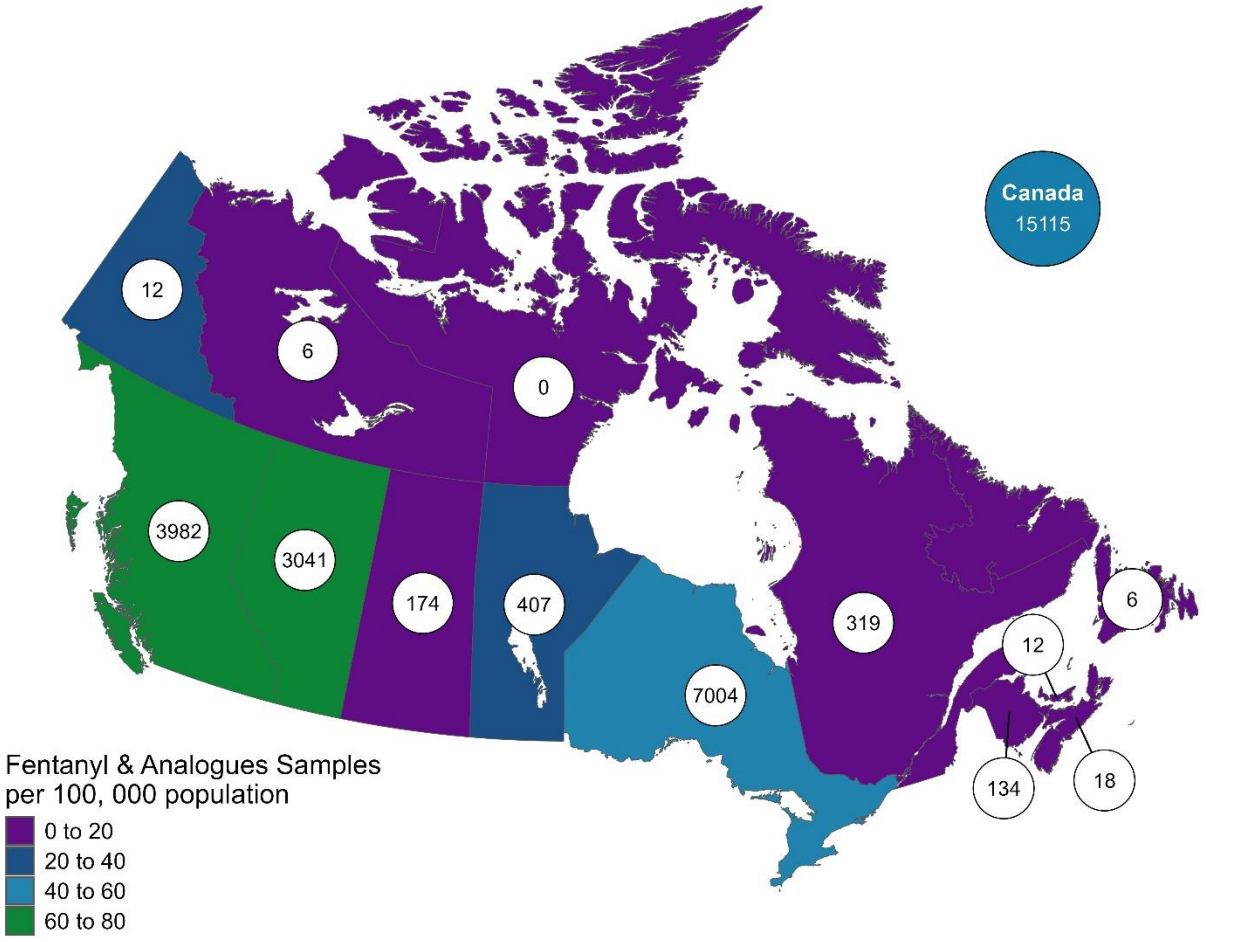
Figure 5. Proportion of the number of substances per opioid samples in powder and tablets or capsule form per Year

FENTANYL SUPPLY IN CANADA

Trends in this section are based on analysis results of samples submitted to the DAS by Canadian law enforcement and public health officials. Trends are presented by way of samples.

Fentanyl is routinely used in clinical settings for anesthesia and analgesia, however illicit Fentanyl has become prevalent nationwide, changing the composition of the illicit opioid supply across Canada. Its distinct pharmacological profile has led to unprecedented rates of mortality and morbidity among people who use drugs. [17]

The number of samples that were found to contain Fentanyl and analogues varied across the country, with high quantities of samples found in Ontario, British Columbia and Alberta in 2023. Adjusting for the population of each Province, the highest rates were in British Columbia and Alberta followed closely by Ontario. Yukon Territory and Manitoba had moderately high rates as well, with the rest of the country being lower (Figure 6).



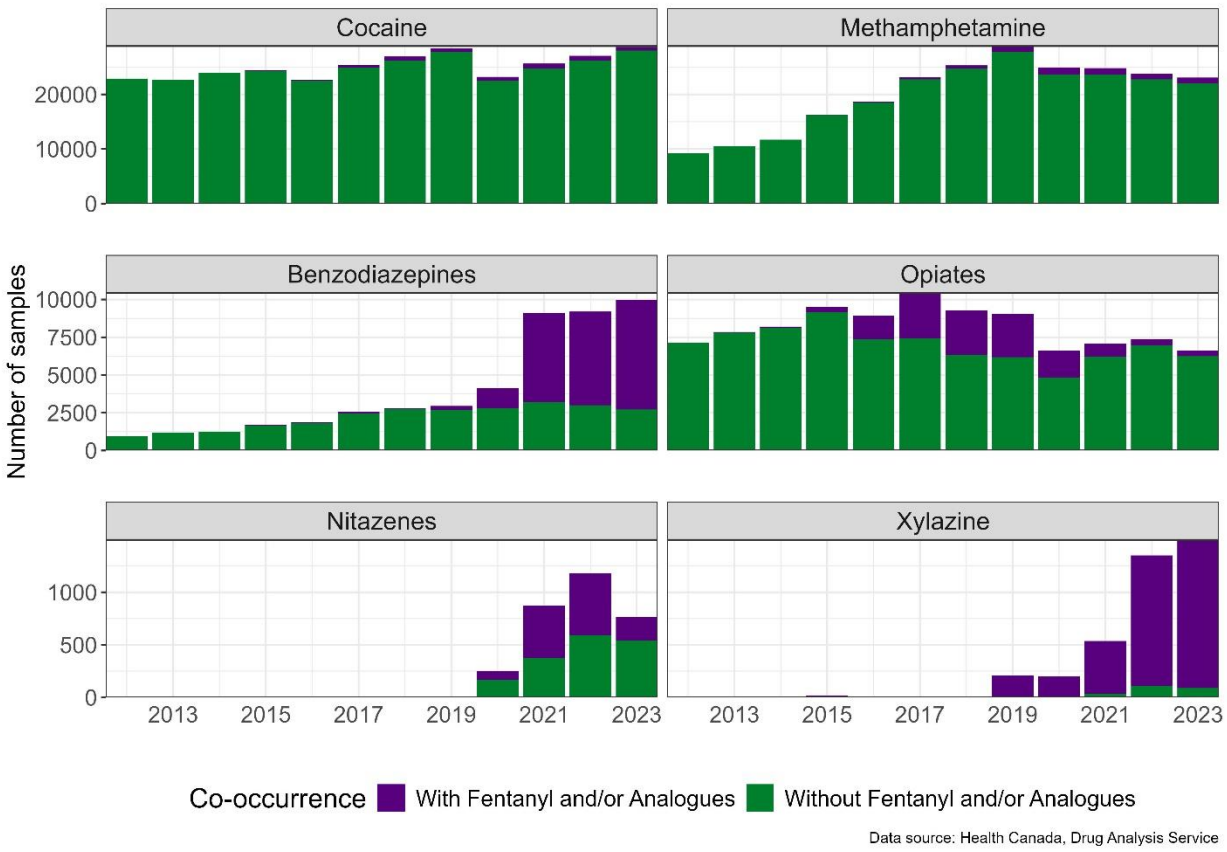
Note: The numbers in the bubbles represent the number of samples per Province/Territory

Figure 6. Number of samples containing Fentanyl and analogues analyzed per 100,000 population by Province/Territory for 2023

Trends in benzodiazepine, stimulant, xylazine, and nitazene samples co-occurring with Fentanyl and analogues

Polysubstance use (defined as the use of 2 or more substances simultaneously, or close in time) presents a serious risk to people who use drugs, including poor health outcomes and death. Exposure to polysubstance use is not always intentional or expected, whereby products from the illicit drug market are inherently uncontrolled and unpredictable. [18]

The simultaneous consumption of benzodiazepines and opioids may increase the risk of overdose since both drug types cause sedation and supress breathing [19]. 2021 saw a marked increase in the number of benzodiazepine samples, with the majority of these samples also containing Fentanyl and/or Fentanyl analogues (Figure 7). This trend varied regionally, with Quebec and the Maritimes having a lower proportion of Benzodiazepine samples that contained Fentanyl and/or Fentanyl analogues compared to the rest of the country (Figure 8).



Note: Samples may contain multiple substances and other substances than those listed.

Figure 7. Samples of Cocaine, Methamphetamine, benzodiazepines, opiates, nitazenes, and Xylazine co-occurring with Fentanyl and/or Fentanyl analogues

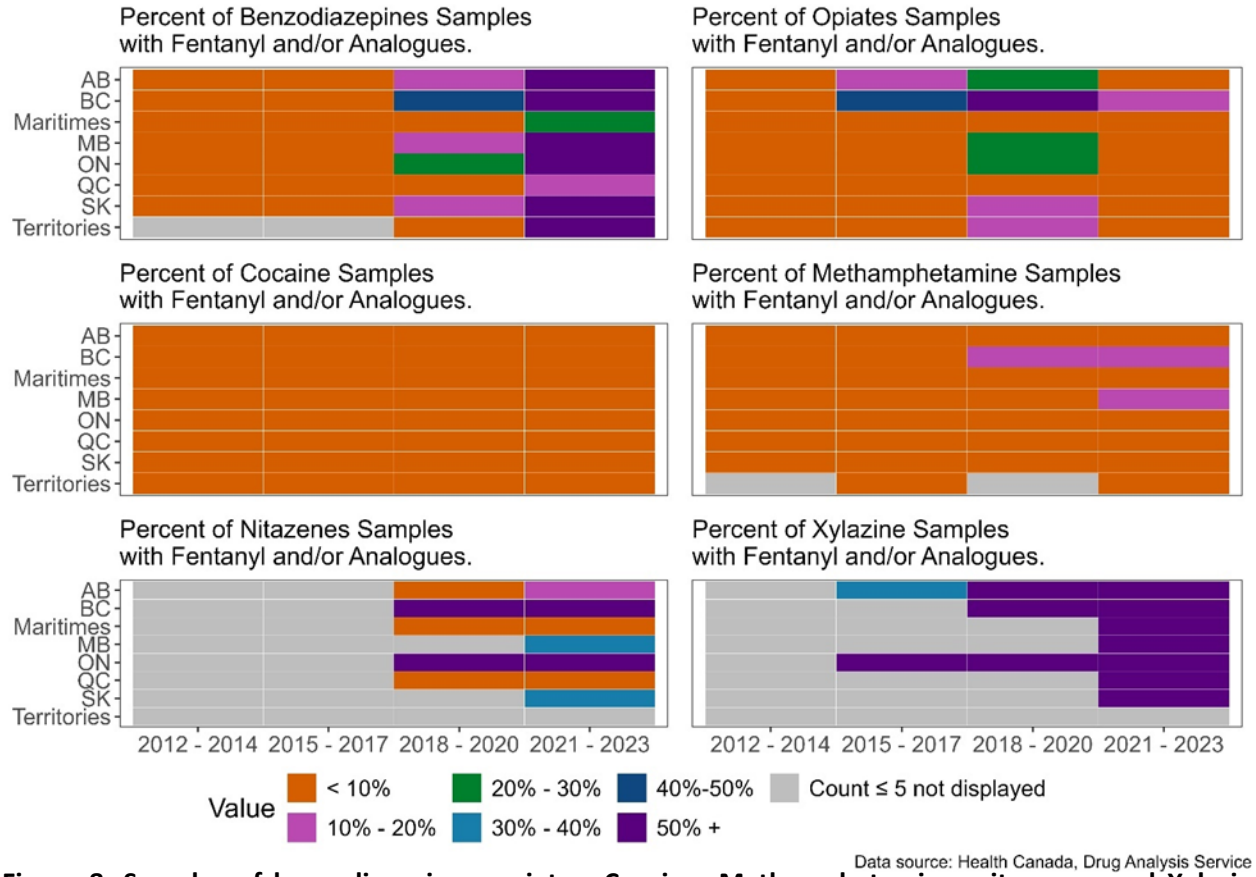
There has been a slight decrease in the proportion of opiates class substance samples that also contain Fentanyl and/or Fentanyl analogues (Figure 7), a trend observed nationwide (Figure 8).

The prevalence of co-occurrence of Fentanyl and/or Fentanyl analogues and stimulants is driven by samples from British Columbia, Alberta and Ontario. In general, Fentanyl and/or Fentanyl analogues have not frequently been identified in Cocaine samples (Figure 7) and this pattern is consistent across regions (Figure 8). Over time, there has been a slight increase in Methamphetamine samples that also contain Fentanyl and/or Fentanyl analogues, rising from 0% in 2012 to just over 4% in 2023 (Figure 7). However, this trend is region-specific, with British Columbia and Manitoba showing the greatest rise in recent years (Figure 8).

Trends in benzodiazepine, stimulant, xylazine, and nitazene samples co-occurring with Fentanyl and analogues (Continued)

Since the emergence of nitazenes in 2019, a significant proportion of nitazene samples have been found to also contain Fentanyl and/or Fentanyl analogues (Figure 7). Regional differences are notable, with the largest proportion of nitazene samples co-occurring with Fentanyl and/or Fentanyl analogues in British Columbia and Ontario (Figure 8).

Xylazine is a non-opioid analgesic, sedative and muscle relaxant used in veterinary medicine [20]. Since its emergence in 2019, the majority of Xylazine samples have been found to also contain Fentanyl and/or Fentanyl analogues (>90%) (Figure 7). This is consistent across regions, with nearly all samples of Xylazine across the country containing Fentanyl and/or Fentanyl analogues (Figure 8).



Data source: Health Canada, Drug Analysis Service

Note:

1. Samples may contain multiple substances and other substances than those listed.

2. Territories (Yukon, Northwest Territories and Nunavut), and the Maritimes (Newfoundland, New Brunswick, Nova Scotia and Prince Edward Island) were grouped due to low counts in these regions.

3. The number of Fentanyl and/or Fentanyl analogues co-occurring with each of the six substance categories is divided by the total number of samples of each of the six substance categories by Province and time period.

Figure 8. Samples of benzodiazepines, opiates, Cocaine, Methamphetamine, nitazenes, and Xylazine co-occurring with Fentanyl and/or Fentanyl analogues by Province/Territory

Trends in Fentanyl co-occurrences with Fentanyl analogues

In the illicit market, substances are often deliberately added into illicit drugs to increase volume or intensify drug effects. Additionally, contaminants may also inadvertently enter during production. Thus, samples may contain various substances in uncertain amounts, raising the risk of harms for people who use drugs. Fentanyl and Fentanyl analogues consumption is therefore not always intentional or expected [21]. Some Fentanyl analogues are more potent than Fentanyl and are responsible for a growing number of severe and fatal opioid-related overdoses. [22]

The number of samples containing Fentanyl and/or its analogues analyzed has increased substantially over time (2012 – 2023), rising from a total of 217 samples in 2012, to 15,115 in 2023. Concurrently, the composition of this group of opioids has shifted. In 2023, there was a considerable decrease in instances where Fentanyl was found alone, without Fentanyl analogues within the same sample. In tandem, there was a marked increase in Fentanyl analogues in general, with many of these co-occurring with Fentanyl (Figure 9, Table 4).

Table 4. Co-occurrence of Fentanyl with Fentanyl analogues in DAS samples by year 2012-2023

Year	Fentanyl alone	Analogues alone	Fentanyl & analogues	Total
2012	217	-	-	**217**
2013	446	48	-	**494**
2014	808	28	1	**837**
2015	1708	44	13	**1765**
2016	3256	290	235	**3781**
2017	5770	966	768	**7504**
2018	7341	895	846	**9082**
2019	9804	1068	991	**11863**
2020	12673	138	676	**13487**
2021	15557	252	768	**16577**
2022	13843	365	1417	**15625**
2023	8837	1757	4521	**15115**

Note: Samples may contain multiple substances and other substances than those listed.

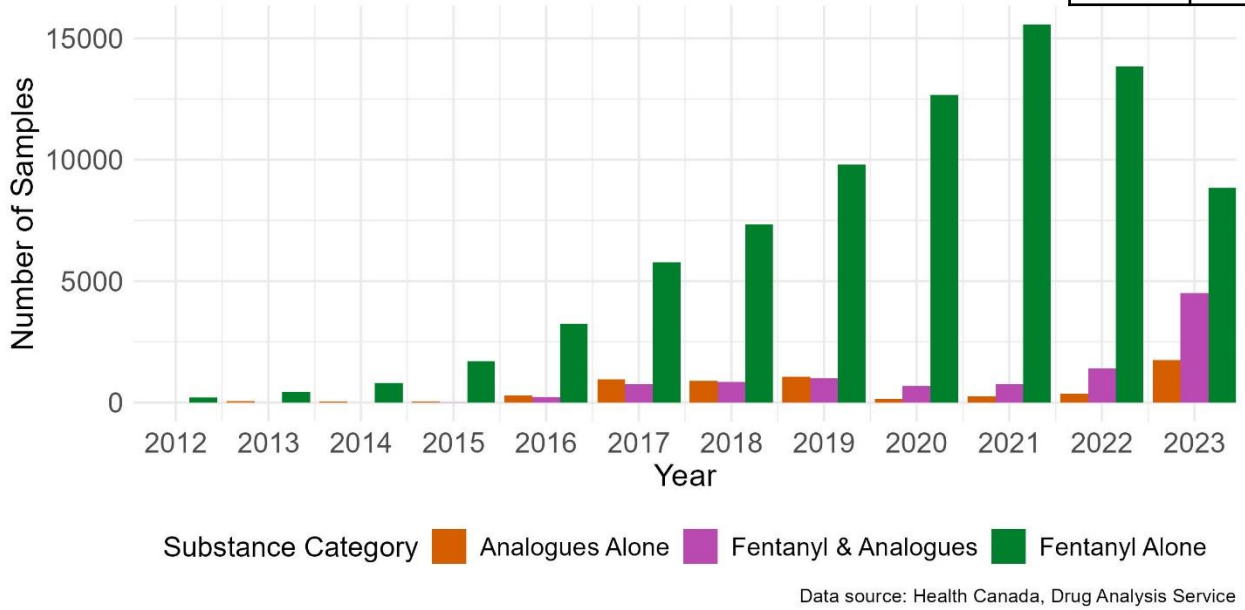


Figure 9. Co-occurrence of Fentanyl with Fentanyl analogues in DAS samples by year 2012-2023

FENTANYL ANALOGUES SUPPLY IN CANADA

Trends in this section are based on analysis results of samples submitted to the DAS by Canadian law enforcement and public health officials. Trends are represented by way of identifications (see ''Data analysis'' section).

Fentanyl analogues

Many Fentanyl analogues have been synthesized since the 1960s. Due to the lack of clinical testing on humans, the relative analgesic potency of most Fentanyl analogues has been inferred from animal experiments, laboratory studies on cells, or investigations of related compounds in humans and toxicological case reports [10]. The main Fentanyl analogues identified by DAS between 2020 and 2022 were Acetylfentanyl, Bromofentanyl, Carfentanil, Cyclopropylfentanyl, Furanylfentanyl, Methoxyacetylfentanyl and para-Fluorofentanyl (Table 5) [8].

Table 5. Main Fentanyl analogues

Fentanyl analogues	First DAS identification in Canada	General information
Acetylfentanyl	**June 2013** **Montreal, Quebec**	Studies suggest that Acetylfentanyl is less potent than Fentanyl (30% as effective) but, approximately 16 times more potent than Morphine [23]. Since its emergence on the illicit market, numerous reports of fatalities and overdose cases associated with Acetylfentanyl have been documented [24].
Bromofentanyl	**November 2021** **Nanaimo, British Columbia**	No data available.
Carfentanil	**July 2016** **Surrey, British Columbia**	Carfentanil has been utilized as a veterinary anesthetic for large animals since 1986. It is documented to be approximately 10 000 times more potent than Morphine, and 100 times more potent than Fentanyl. Numerous reports of fatalities and overdose cases associated with Carfentanil have been reported [24] [22].
Cyclopropylfentanyl	**September 2017** **Surrey, British Columbia**	Limited information is available, but some studies suggest that Cyclopropylfentanyl exhibits a potency that is approximately threefold or higher than Fentanyl [25].
Furanylfentanyl	**July 2016** **Surrey, British Columbia**	While there are no specific studies on its potency, Furanylfentanyl has been identified in several reports of fatalities [23].
Methoxyacetylfentanyl	**March 2018** **Nanaimo, British Columbia**	Limited information is available, but some studies suggest that Methoxyacetylfentanyl has a potency that is approximately 30% of the potency of Fentanyl [23].
para-Fluorofentanyl	**February 2017** **Victoria, British Columbia**	There is little information in the literature concerning its potency, but it is likely similar to Fentanyl [23].

Fentanyl analogues (Continued)

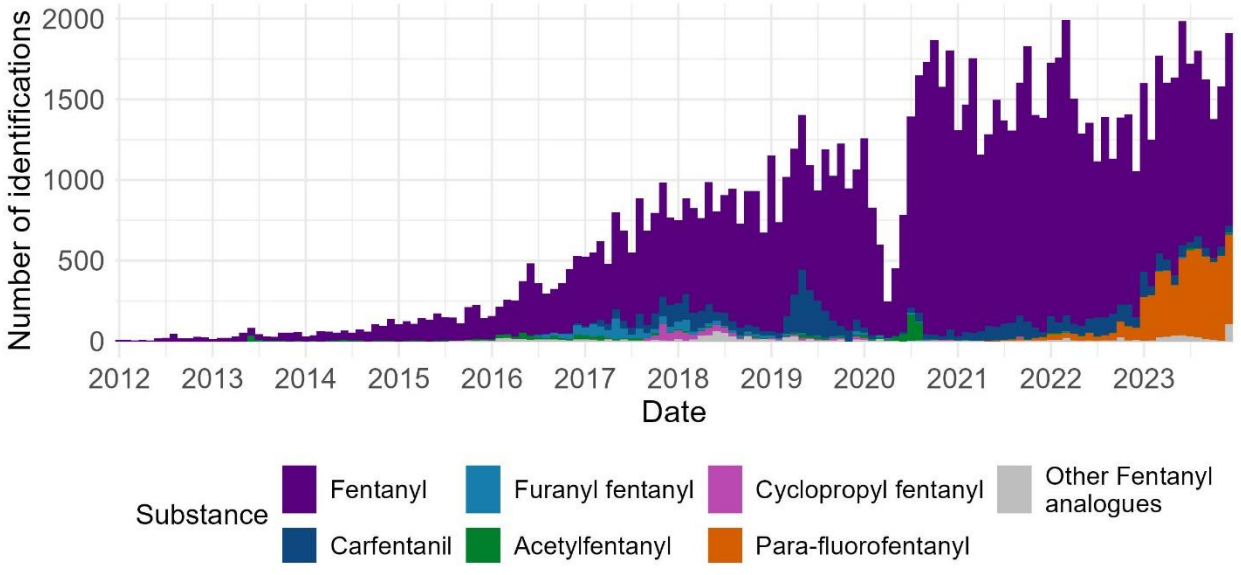
Despite the fluctuations in the prevalence of Fentanyl analogues, Fentanyl itself continues to dominate the opioid drug supply. In 2022, Fentanyl identifications outnumbered Fentanyl analogue identifications by approximately 10 to one. Most recently, in 2023, this ratio decreased to twice the number of identifications of Fentanyl compared to Fentanyl analogues (Figure 10).

Among Fentanyl analogues, Carfentanil was the most frequently identified until 2023, where para-Fluorofentanyl became the most commonly identified by a significant margin. Carfentanil reached its peak in early 2019 (Figure 10).

Para-Fluorofentanyl was first identified by the DAS in a sample from British Columbia in February 2017. In 2021 and 2022, it emerged as the second most identified Fentanyl analogue after Carfentanil, eventually surpassing it in 2023 (Figure 10). In 2023, over 70% of samples with para-Fluorofentanyl also contained Fentanyl, and approximately 50% contained a benzodiazepine (data not shown).

Bromofentanyl was first identified by the DAS in a sample from British Columbia in November 2021. In 2022, it ranked as the third most frequently identified Fentanyl analogue. In 2023, almost all samples with Bromofentanyl also contained Fentanyl (99%) and a majority (61%) of Bromofentanyl samples contained a benzodiazepine (data not shown).

Since 2020, over 70% of sample containing at least one Fentanyl analogue also contained Fentanyl (data not shown).



Data source: Health Canada, Drug Analysis Service

Note: Decrease of identifications in April 2020 is due to a number of factors related to the COVID-19 pandemic.

Figure 10. Fentanyl and Fentanyl analogue identifications in Canada (2012 to 2023)

CONCLUSION

This *In Focus* report provides a summary of the trends in the main opioids identified and the co-occurrences of Fentanyl with other substances including benzodiazepines, Methamphetamine, nitazenes, and Xylazine based on samples submitted to DAS in the past 12 years.

Until 2016, the opiates, which include Heroin, Morphine, Oxycodone, and Hydromorphone, were the primary opioids identified. However, in 2016, there was a shift, with Fentanyl emerging as the most frequently identified opioid. Fentanyl has continued dominating the illicit drug market since then.

Regarding the co-occurrence of Fentanyl with other substances, benzodiazepines are frequently detected alongside Fentanyl and/or Fentanyl analogues, and Xylazine is almost always found alongside Fentanyl and/or Fentanyl analogues.

Turning to the prevalence of Fentanyl analogues, Carfentanil, and para-Fluorofentanyl are the most frequently identified substances in samples analyzed by DAS. However, the number of Fentanyl identifications was approximately ten times higher than the number of Fentanyl analogue identifications in 2022. In 2023, the rise of para-Fluorofentanyl has changed this ratio significantly and is now the most commonly occurring opioid other than Fentanyl. For more specific information about Fentanyl, please refer to our report "Spotlight: The evolution of Fentanyl in Canada over the past 11 years" [26].

Continued monitoring of the opioid supply in Canada is necessary to ensure accurate information is available regarding the presence of harmful substances on the Canadian illicit drug market.

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REFERENCES

[1] Public Health Agency of Canada, "Evidence synthesis - The opioid crisis in Canada: a national perspective," Health Promotion and Chronic Disease Prevention in Canada, vol. 38, no. 6, 2018.

[2] L. Hatt, "The Opioid Crisis in Canada," 6 January 2022. [Online]. Available: https://lop.parl.ca/sites/PublicWebsite/default/en_CA/ResearchPublications/202123E. [Accessed 24 03 2023].

[3] Public Health Agency of Canada, "Federal, provincial, and territorial Special Advisory Committee on the Epidemic of Opioid Overdoses. Opioid- and Stimulant-related Harms in Canada.," June 2024. [Online]. Available: https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants/. [Accessed 04 09 2024].

[4] Wickham H, Averick M, Bryan J, Chang W, McGowan LD, François R, Grolemund G, Hayes A, Henry L, Hester J, Kuhn M, Pedersen TL, Miller E, Bache SM, Müller K, Ooms J, Robinson D, Seidel DP, Spinu V, Takahashi K, Vaughan D, Wilke C, Woo K, Yutani H, "Welcome to the tidyverse," Journal of Open Source Software, vol. 4, no. 43, p. 1686, 2019.

[5] Government of Canada, "Opioids," 05 07 2022. [Online]. Available: https://www.canada.ca/en/health-canada/services/opioids.html. [Accessed 24 03 2023].

[6] Government of Canada, "Naloxone," 19 12 2022. [Online]. Available: https://www.canada.ca/fr/sante-canada/services/opioides/naloxone.html. [Accessed 24 03 2023].

[7] Government of Canada, "Controlled Drugs and Substances Act (S.C. 1996, c. 19)," 14 01 2023. [Online]. Available: https://laws-lois.justice.gc.ca/eng/acts/c-38.8/. [Accessed 24 03 2023].

[8] Drug Analysis Service, "Analyzed Drug Report," 08 03 2023. [Online]. Available: https://health-infobase.canada.ca/drug-analysis-service/analyzed-drug-report.html?p=CA&y=2020&q=all. [Accessed 24 03 2023].

[9] Gouvernement of Canada, "Fentanyl," [Online]. Available: https://www.canada.ca/en/health-canada/services/substance-use/controlled-illegal-drugs/fentanyl.html. [Accessed 21 July 2022].

[10] S. H. Hassanien, J. R. Bassman, C. M. Perrien Naccarato, J. J. Twarozynski, J. R. Traynor, D. M. Iula and J. P. Anand, "In vitro pharmacology of fentanyl analogs at the human muopioid receptor and their spectroscopic analysis," Drug Testing and Analysis, vol. 12, no. 8, pp. 1212-1221, 15 May 2020.

[11] V. H. Ruben Vardanyan, "Chapter 3 - Analgesics," in Synthesis of Best-Seller Drugs, Academic Press, 2016, pp. 15-64.

[12] J. W. Busse, S. Craigie, D. N. Juurlink, N. D. Buckley, L. Wang, R. J. Couban, T. Agoritsas, E. A. Akl, A. Carrasco-Labra, L. Cooper, C. Cull, B. R. da Costa, J. W. Frank, G. Grant, A. Iorio, N. Persaud, S. Stern, P. Tugwell, P. O. Vandvik and G. H. Guyatt, "Guideline for opioid therapy and chronic noncancer pain," Canadian Medical Association Journal, vol. 189, no. 18, pp. 659-666, 2017.

[13] C. W. Reichle, G. M. Smith, J. S. Gravenstein, S. G. Macris and H. K. Beecher, "Comparative Analgesic Potency of Heroin and Morphine in Postoperative Patients," The Journal of Pharmacology and Experimental Therapeutics, vol. 136, no. 1, pp. 43-46, 1962.

[14] Government of Canada, "Heroin," 14 03 2023. [Online]. Available: https://www.canada.ca/en/health-canada/services/substance-use/controlled-illegal-drugs/heroin.html. [Accessed 24 03 2023].

[15] K. Tennyson, C. Ray and K. Maass, "Fentanyl and Fentanyl Analogues: Federal Trends and Trafficking Patterns," United States Sentencing Commission, 2021.

[16] Canadian Community Epidemiology Network on Drug Use, "CCENDU Drug Alert: Nitazenes," Canadian Centre on Substance Use and Addition, 2022.

[17] H. E. Bird, A. S. Huhn and K. E. Dunn, "Fentanyl Absorption, Distribution, Metabolism, and Excretion: Narrative Review and Clinical Significance Related to Illicitly Manufactured Fentanyl.," Journal of Addiction Medicine, vol. 17, no. 5, pp. 503-508, 2023.

[18] J. N. P. Park, K. E. Schneider, D. Fowler, S. G. Sherman, R. Mojtabai and P. S. Nestadt, "Polysubstance Overdose Deaths in the Fentanyl Era: A Latent Class Analysis.," Journal of Addiction Medicine, vol. 16, no. 1, pp. 49-55, 2022.

[19] National Institute on Drug Abuse, "Benzodiazepines and Opioids," 7 November 2022. [Online]. Available: https://nida.nih.gov/research-topics/opioids/benzodiazepines-opioids#:~:text=Combining%20opioids%20and%20benzodiazepines%20can,addition%20to%20impairing%20cognitive%20functions.. [Accessed 31 March 2023].

[20] National Institute on Drug Abuse, "Xylazine," June 2024. [Online]. Available: https://nida.nih.gov/research-topics/xylazine#treat-xylazine-related-wounds. [Accessed 06 09 2024].

[21] D. Y. M. M.-H. B. M. C. L. P. B. J. Payer, "Adulterants, Contaminants and Co-occuring Substances in Drugs on the Illegal Market in Canada: An analysis of data from drug seizures, drug checking and urine," Canadian Centre on Substance Use and Addiction, Ottawa, 2020.

[22] A. L. A. Mohr, B. K. Logan, M. F. Fogarty, A. J. Krotulski, D. Papsun, S. L. Kacinko, M. A. Huestis and J. D. Ropero-Miller, "Reports of Adverse Events Associated with Use of Novel Psychoactive Substances, 2017–2020: A Review," Journal of Analytical Toxicology, vol. 46, pp. 116-185, 2022.

[23] Y. Higashikawa and S. Suzuki, "Studies on 1-(2-phenethyl)-4-(N-propionylanilino)piperidine (fentanyl) and its related compounds. VI. Structure-analgesic activity relationship for fentanyl, methyl-substituted fentanyls and other analogues," Forensic Toxicology, vol. 26, pp. 1-5, 2008.

[24] M. P. Prekupec and M. H. Baumann, "Misuse of Novel Synthetic Opioids: A Deadly New Trend," Journal of Addiction Medecine, vol. 11, no. 4, pp. 256-265, 2017.

[25] M. Wilde, S. Pichini, R. Pacifici, A. Tagliabracci, F. P. Busardo, V. Auwärter and R. Solimini, "Metabolic Pathways and Potencies of New Fentanyl Analogs," Frontiers in Pharmacology, vol. 10, 2019.

[26] Governement of Canada, Health Canada Drug Analysis Service, "Spotlight: The evolution of Fentanyl in Canada over the past 11 years," 2023. [Online]. Available: https://www.canada.ca/en/health-canada/services/publications/healthy-living/evolution-fentanyl-canada-11-years.html.

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