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Research Article

Population-Based Stimulant Toxicity Death Rate in Newfoundland and Labrador: A Retrospective Cohort Study

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Abstract

Objective: Substance use is a growing concern in Canada that is characterized by a multitude of contributing factors. Subsequently, there has been a rise in both the harms associated with substance use as well as substance-related acute toxicity deaths. This study will quantify stimulant toxicity deaths in Newfoundland and Labrador. Methods: This study used a retrospective cohort design to characterize the sample of patients who died via stimulant toxicity in NL from January 1st, 2020 to December 31st, 2023. Results: Stimulant-related deaths in Newfoundland and Labrador increased between 2020 (n=10) and 2023 (n=31); this increase is generally in line with national trends. Males consistently surpassed females for all stimulant-related drug toxicity deaths throughout our period of observation by large ratios. Both sexes have seen upward trends in total stimulant-related drug toxicity deaths for each year of observation. Stimulants were frequently used in conjunction with opioids. We were interested in the role of polysubstances within our sample and found that almost half (48.5%) of the substances involved in stimulant-related deaths contained opioids. Conclusion: Significant increases in stimulant-related mortality warrant further study of stimulant use in the country and reinforce the need to identify effective policy solutions. Almost all (96%) stimulant-related deaths reported in NL from 2020-2023 were accidental, further justifying the need for the identification of relevant risk factors and effective initiatives aimed at reducing stimulant misuse.

Keywords

Toxic Drug Supply, Apparent Stimulant-related Toxicity Mortality, Newfoundland and Labrador, Health Canada, Substance-Related Harms Surveillance Models, Public Health

1. Highlights

The majority of stimulant toxicity deaths that occurred between January 1st, 2020 to December 31st, 2023 in Newfoundland and Labrador (NL) were deemed accidental. Stimulant toxicity highlights a public health concern in NL, preventable deaths sounding the alarm on the need for harm reduction initiatives to curb this trend. While males consistently surpassed females for all stimulant-related drug toxicity deaths throughout our period of observation, both sexes have

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seen upward trends in total stimulant-related drug toxicity deaths. Stimulant-related deaths in NL increased between 2020 (n=10) and 2023 (n=31); this increase is generally in line with national trends.

2. Background & Significance

2.1. Prevalence of Stimulant Use in Canada

Substance use is a growing concern in Canada that is characterized by a multitude of contributing factors that have continued to persist after the Covid-19 pandemic [1, 2]. Subsequently, there has been a rise in both the harms associated with substance use as well as substance-related acute toxicity deaths [1]. Concerted efforts have been initiated to elucidate both the extent of substance use in Canadian society as well as the burden of disease and acute drug toxicity deaths to better support public health policy related to harm reduction. The dominant focus for these efforts has been opioids. However, the use of stimulants has been increasing globally. The prevalence of illicit stimulant use is highest in North America [3]. To mitigate the harms associated with substance use, we must examine and describe what substance use is, in addition to its prevalence in Canada. Stimulants will be the primary focus of this study. Associated harms will be explored nationally and will be explored using publicly available data from national surveillance systems. Further, we will focus on stimulant-related toxicity deaths in Newfoundland and Labrador using mortality data collected from the Office of the Chief Medical Examiner of the province.

Stimulants are defined as substances that act on monoaminergic pathways in the brain and involve neurotransmitters such as norepinephrine, dopamine and serotonin. They act on both the central and peripheral nervous systems to increase energy, attention, alertness, and wakefulness [4]. Most common stimulants include caffeine, cocaine, amphetamines, and methamphetamines. Stimulants are seen in everyday items such as coffee as well as prescription pharmaceuticals for the treatment of attention deficit and hyperactivity disorder (ADHD) [5]. For ADHD, stimulant medications are approved by the FDA and Health Canada for use in adults and pediatric populations [6]. Stimulants can also be seen in illicit forms such as cocaine. Cocaine is considered a Schedule I drug in the Canadian Controlled Substances Act, a substance that is regulated and only legal when it is prescribed or administered by a health care provider [1]. High doses and chronic use of stimulants can cause neurological, psychological, and physical damage through multiorgan toxicity of the heart, lungs, liver and kidneys [7]. The use of multiple classes of drugs as well as the use of both illicit and pharmaceutical forms of a class of drugs in combination contributes to increased adverse effects [8]. Moreover, the contamination of street drugs is inevitable as additives and cutting agents are frequently employed to increase profit. In fact, a recent study from the United States found that when samples of stimulants such as cocaine were tested for fentanyl; approximately 9.1% of the sample tested positive, highlighting the emerging and worsening issues faced concerning unsafe drug supply [8]. Similar reports exist in Canada; however, the focus has been largely on British Columbia and the Opioid Crisis. In addition, less is known about the landscape across Canada regarding stimulant contamination and much less about stimulant-related acute toxicity deaths. As such, this paper will first aim to elucidate the extent of stimulant use in Canada and thereafter assess the impact by reporting harms such as acute toxicity deaths with a particular focus on Newfoundland and Labrador.

2.2. Prescription and Illicit Stimulant Use

Stimulant use can vary from prescription use to recreational or performance enhancement in academia or athletic endeavors [4]. Prescription stimulants, such as amphetamines, are most often used for ADHD treatment [9]. Some market names for these medications include Vyvanse, Concerta, Adderall, and Ritalin [9]. Prescription stimulants in Canada are classified as Schedule III substances under the Canadian Controlled Substances Act [10]. Like opioid substances, stimulants can be highly addictive and often used in tandem with other substances, which can lead to difficulty in successfully treating stimulant use disorder [11].

In addition to the overuse and misuse of prescribed stimulants, the use of illicit stimulants and toxicity in the illegal drug supply for substances like cocaine raises concerns for safety and harm. Cocaine has been on the rise in Canada for several decades and can be used in a variety of ways, including inhalation, smoking, or injection, all producing a feeling of euphoria and a rush of energy [12]. The prevalence of cocaine use in the general Canadian population in 2019 was approximately 2% of the population and 9% for those aged 20-24, illustrating that it's a substance favored by younger individuals [12, 13]. This rise in substance use is correlated with a rise in substance-related deaths, many of which include cocaine, as it is often taken in combination with other substances [12, 14]. As such, it's vital to both understand the extent of use as well as assess the burden of death from cocaine use.

The reliance on cocaine use outside of recreational use is poorly understood. One author reported that non-prescription or illicit stimulants can be used for a variety of reasons, including trauma and stigma management, pain management, and functional reasons like increased energy and alertness [14]. Qualitative research suggests that stimulants play a role in the self-management of pain, and pain management using stimulants has been well-documented among patients living with HIV and chronic pain. Additionally, stimulants have been reported to have been used to increase energy and productivity levels, lower depression, and reduce the need for sleep, which may be especially important for unhoused individuals in lowering their risk while living outside and in unsafe environments [14]. Non-prescription stimulants may also

be used by ADHD patients to self-medicate when they do not have access to prescription medications [15]. Understanding the motivations behind the misuse of stimulants can serve to destigmatize stimulant use and facilitate better care and health outcomes for stimulant users.

The growing epidemic of stimulant misuse involves the use of both illicit stimulants as well as the non-medical use of prescription stimulants [16]. While cocaine and methamphetamine are the most used illicit stimulants, some suggest that nonmedical use of prescription stimulants serves as a gateway to future illicit substance use, especially among youth [16, 17]. Prescription stimulants are widely available, and many may perceive these medications as non-addictive or without harmful impacts when not used as originally prescribed. Prescription stimulants are normalized among certain populations, such as university students who use diverted prescription stimulants for studying and schoolwork [16]. Recent research has shown that prescription stimulant use is more common than illicit substance use. However, trends in the opioid epidemic demonstrate that misuse of prescription drugs may later develop into the use of similar illicit substances [16].

Worryingly, there are rising rates of polysubstance use among individuals who use both prescription and non-prescription stimulants [8, 17]. This likely contributes to rising occurrences of stimulant overdose deaths as stimulants are being used concurrently with synthetic opioids [17, 18]. Shearer et al. [17] found a high co-occurrence of stimulant and opioid use. Individuals who use stimulants concurrently with other substances often do so to counteract sedation or to enhance the effects of one of the other drugs [8]. Polysubstance use may also be associated with particular personality traits. LaBossier & Hadland [16] found that higher levels of hopelessness and sensation seeking were associated with a greater likelihood of any substance use. Understanding polysubstance use and its motivations among stimulant users may be beneficial in reducing the negative compounding effects of each substance and reducing overall mortality.

2.3. Harms Associated with Stimulant Use

There are a variety of harms associated with the chronic and high dose use of stimulants. Health effects of prescription stimulant misuse include psychosis, anger, paranoia, and increased risk of infectious diseases [19]. Numerous physical and mental harms arise from stimulant misuse.

2.3.1. Physical Health Harms

There are several physical harms associated with stimulant overdose. Tremors, tachypnea, fever, panic, GI upset, muscle pain, abnormal reflexes, and weakness are all symptoms associated with prescription stimulant toxicity [19]. Additionally, cardiovascular system dysfunction resulting in arrhythmia or myocardial infractions can result from chronic and high-dose use of prescription and nonprescription stimulants [19]. Cocaine use is suspected of worsening cardiomyopathy through various factors, including an increase in catecholamine, affecting endothelial function, enhancing thrombosis, and impairment of calcium transport [20]. Moreover, a systematic review of cocaine use and stroke risk revealed that cocaine use increased the risk of atherosclerosis and various types of strokes, including hemorrhagic and ischemic stroke [21]. The impact and consequences of inappropriate use and misuse of stimulants demonstrate both immediate and long-term harm to the function of vital organs.

2.3.2. Dental Health

Increased stimulant use can also contribute to poor dentition [22]. Oral cocaine use has been linked to damaging issues with oral mucosal tissues, such as mucosal lesions [22, 23]. There is significant evidence to suggest that methamphetamine use is associated with tooth damage, including tooth decay and cavities, and potentially leading to tooth extraction [22].

2.3.3. Injection Harms

People who inject drugs (PWID) can have various vein complications at injection sites [24]. Femoral injection increases risks of venous insufficiency and deep vein thrombosis. This has the potential to cause venous ulcers, tissue necrosis, pulmonary embolisms and more. Overuse of acidifiers such as citric acid is often used with drug preparation, which can lead to painful injections and damage to peripheral veins [24]. Injection stimulant use has been associated with increased risk of various infectious diseases, such as HIV, hepatitis and infectious endocarditis [19, 25]. Addiction to stimulants such as cocaine or crack can result in negative health problems, including blood-borne bacterial and viral infections [26]. This is mainly through contaminated injection drug equipment [27]. As the hepatitis C virus (HCV) is transmitted through infectious blood/bodily fluids, the most common route of transmission for this is through needle sharing with injecting drug use [28]. Despite some stimulants, such as cocaine, being consumed orally or by snorting, HCV transmission is still possible through shared straws and pipes that are contaminated with blood and saliva [28].

2.3.4. Mental Health

The co-occurring relationship between mental health and substance use is multifaceted and complex [29]; it is not uncommon for mental illness and substance use to be comorbidities. For instance, individuals living with Substance Use Disorder (SUD) may have other co-occurring disorders impacting their mental health, including anxiety, depression, ADHD, bipolar disorder, personality disorders, schizophrenia [30]. SUD affects a person's brain and behavior which may inhibit a person's ability to control their substance. Various mental health issues have been documented in amphetamine stimulant users, and amphetamine use is a risk factor for poor

mental health [29]. Amphetamine psychosis is a potential side effect; symptoms of this can include hallucinations, paranoia and delusions [31]. Cocaine use has been shown to exacerbate symptoms of mental disorders, particularly mood disorders; using cocaine can cause high rates of psychological distress, depression and suicidal thoughts [32].

2.3.5. Drug Toxicity

Stimulant toxicity has been a rising concern in Canada [33]. As polysubstance use increases, harms associated with stimulant use have followed suit [34]. Fentanyl in the unregulated drug supply has been a catalyst in cocaine and methamphetamine toxicities [33]. Simulant-related mortality in Canada has become a serious concern; over half of opioid toxicity deaths since 2018 involved a stimulant [33]. The majority of stimulant toxicity deaths have been reported as accidental, with the highest percentages involving cocaine or methamphetamine. As the prevalence of stimulant use has increased in Newfoundland and Labrador in recent years, deaths involving stimulants with opioids have increased from 2019 to 2021, and harms of cocaine and methamphetamine use have been increasing provincially and nationally [33].

3. Methods

3.1. Study Design and Objectives

This study used a retrospective cohort design to characterize the sample of patients who died via stimulant toxicity in NL from January 1st, 2020 to December 31st, 2023. For the annual substance breakdown, data was collected from 2021-2023; data was unavailable before 2021. This study received ethical approval from the Health Research Ethics Board of NL (Reference # 20240389). Of note, reporting from 2023 is "open-year data" in that cases were still pending at the time of analysis. This means that counts presented for 2023 nationally and provincially do not represent the entirety of the burden seen, as the numbers may rise as forensic investigations of cases close for the calendar year.

The objectives of this study were:

1) Examine and summarize stimulant toxicity deaths in NL
2) Describe and quantify fatal stimulant toxicity deaths by manner of death in NL
3) Examine and describe patient demographics, such as sex and age, of the sample of fatal stimulant toxicity deaths

3.2. Study Population and Data

Manual identification of cases through physical charts at the Office of Chief Medical Examiner (OCME) was examined with data abstraction conducted on identified cases. All abstraction and reporting on these physical charts was provided after review and consideration by the Chief Medical Examiner of NL. MedEx (an in-house Microsoft Access database) was also utilized to confirm all cases within the OCME for this period. The MedEx database is governed by the Office of the Chief Information Officer (OCIO) and the Department of Justice and Public Safety, Government of NL. Data was collected on the following: year of death, date of birth, sex, date of death, medical examiner number, and region of death. All drug toxicity deaths within this cohort included a thorough toxicology analysis and review using samples taken from decedents' bodies during the forensic investigation (autopsy or external examination). Deaths are certified by a Medical Examiner who designates the manner and cause of death, including which substances contributed to the death in drug toxicity cases after a thorough investigation is completed.

The national Infobase database only began reporting on stimulant-related deaths in 2020; data on stimulant deaths before this year are not available. The stimulant data for 2023 was captured from closed cases at the OCME, NL, as of March 3, 2024. 2023 is an open year, and these numbers do not reflect the total number of stimulant-related deaths for the calendar year, as pending cases are ongoing at the time of this report.

3.3. Statistical Analysis

Descriptive statistics (frequencies, percentages, counts) were used to describe decedents demographics of the sample. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) v28 (IBM USA). Descriptive statistics and measures of central tendency were conducted to describe the cohort, including the annual prevalence of drug toxicity deaths, the manner of each death, and sex and age breakdown.

4. Results

4.1. Stimulant-related Drug Toxicity Deaths

Manner of death for stimulant toxicity deaths in this study are considered accidental (not intentional) or "other"; "other" manner includes a combination of suicide and undetermined deaths. All drug toxicity deaths included a thorough toxicology analysis and review using samples taken from decedents' bodies during the forensic investigation (autopsy or external examinations). The number of accidental toxicity deaths from stimulants in NL ranged from n=10 (in 2020) to n=30 (in 2023), as displayed in Table 1. The prevalence of stimulated-related drug toxicity is, therefore, increasing substantially. For 2021-2023, there was 1 stimulant-related drug toxicity death classified as "other," which, for this report, refers to a death deemed either suicidal or undetermined.

4.2. Sex Demographic for Stimulant-Related Drug Toxicity

Males consistently surpassed females for all stimulant-related drug toxicity deaths throughout our period of observation by large ratios. For 2020, males accounted for 90% (n=9) of total stimulant toxicity deaths. In 2021, males accounted for 81% (n=13) of the stimulant toxicity deaths and in 2022, males accounted for 74% (n=14) of the stimulant drug toxicity mortalities. For our final year of observation (which is still under review), males accounted for 65% (n=20) of total stimulant toxicity deaths. The manner of death for both sexes was hugely accidental throughout the 4 years. Both sexes have seen upward trends in total stimulant-related drug toxicity deaths for each year of observation, as displayed in *Table 1*.

Table 1. *Annual Stimulant-related Drug Toxicity Deaths NL 2020-2023.*

	Year			
	2020	**2021**	**2022**	**2023**
Manner of Death				
Accident	10	15	18	30
Other	0	1	1	1
TOTAL	10	16	19	31
Sex				
Female	1	3	5	11
Male	9	13	14	20

4.3. Age Demographic for Stimulant-Related Drug Toxicity

Age was a variable under analysis for all stimulant-related toxicity deaths in NL from 2021-2023. Data pertaining to the decedents' age was not available before 2021. The age cohort 51-60 accounted for the largest percentage (31%; n=5) of stimulant-related drug toxicity deaths for 2021. For 2022, the age cohort 41-50 accounted for the largest percentage (37%; n=7) of stimulant-related drug toxicity deaths. The age cohort 51-60 accounted for the largest percentage (29%; n=9) of stimulant-related drug toxicity deaths for the confirmed 2023 cases to date. The age cohort 21-30 was close in prevalence for 2023 at 26% (n=8).

Table 2. *Annual Stimulant-related Drug Toxicity Deaths NL 2021-2023 by Age Groups.*

	Age Groups						
Year	**≤ 20**	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**	**71-80**
2021	1	1	4	4	5	1	0
2022	1	1	4	7	3	3	0
2023	1	8	6	6	9	1	0

4.4. Annual Stimulant-related Drug Toxicity Deaths NL 2021-2023 Substance Breakdown

The use of more than one drug, also known as polysubstance use, is common and is a catalyst behind drug toxicity in Canada. Polysubstance use is when two or more drugs are taken together or within a short time period, either intentionally or unintentionally. According to the Canadian Center on Substance Use and Addiction [35], people who use drugs consume, on average, between 2.6 and 4.0 different substances. Individuals who consume multiple substances may do so for a variety of reasons, such as the desire to enhance the effect of drug use or subdue the negative effect of one drug (such as the use of "Downers") or to mimic the effect of a drug that is not available [34, 35]. However, despite the reasoning behind polysubstance use, it is now the norm in Canada rather than the exception [35]. This is important with regard to stimulant use in NL, as the data shows a prevalence of stimulant and opioid polysubstance use. According to our data, polysubstance use is common with stimulant use in NL, especially cocaine. As shown in *Table 3*, stimulants were frequently used in conjunction with opioids. We were interested in the role of polysubstances within our sample and found that almost half (48.5%) of the substances involved in stimulant-related deaths contained opioids. Polydrug use, especially as it relates to adulteration of the illicit drug supply, is

thought to be one of the major driving forces behind the national increases in stimulant-related deaths and warrants further study within the province [33].

Table 3. Annual Stimulant-related Drug Toxicity Deaths NL 2021-2023 Substance Breakdown.

Year	Stimulants (excluding cocaine) with Opioids	Stimulants (excluding cocaine) without Opioids	Cases involving Cocaine
2021	8	8	11
2022	9	10	18
2023	15	16	29

4.5. National Stimulant-related Mortality Data

Most provinces and territories reported an increase in stimulant-related deaths from 2018 to the second quarter of 2023. Of importance to note is that the numbers for 2023 are incomplete and include quarters one and two of the annum. As displayed in Table 4, data were suppressed in provinces or territories with low numbers of cases in order to comply with confidentiality rules [36]. Given the available data, there were 15,550 reported stimulant-related deaths in Canada between 2018 and the first two quarters of 2023. There were significant increases in Canadian stimulant-related deaths between 2019 (n=1928) and 2020 (n=3438).

Table 4. National Stimulant-related Mortality Data 2018-2023 (end of Q2).

Province/Territory	Year					
	2018	2019	2020	2021	2022	2023
BC	1,089	557	1,040	970	625	273
SK	80	95	179	264	227	106
MB	NA	81	249	281	50	NA
ON	916	1,025	1,728	2,081	1,932	904
QC	163	142	195	NA	NA	NA
NS	25	28	34	35	46	21
NL	NA	NA	10	16	19	31
YK	NA	NA	NA	6	15	2
NT	NA	NA	3	3	4	0
NU	0	*	0	0	*	0

Suppressed (*): Data may be suppressed in provinces or territories with low numbers of cases to comply with confidentiality rules.
Not Available (NA): Data were not available at the time of this publication.
Source: Federal, provincial, and territorial Special Advisory Committee on the Epidemic of Opioid Overdoses. Opioid- and Stimulant-related Harms in Canada. Ottawa: Public Health Agency of Canada; December 2023. https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants [36]

5. Discussion

Stimulant-related deaths in Newfoundland and Labrador increased between 2020 (n=10) and 2023 (n=31); this increase is generally in line with national trends. The upward trend in stimulant-related deaths was present across males and females in NL between 2020-2023, with male deaths increasing 45% and female deaths increasing by (1100%). The vast majority of stimulant-related deaths in NL from 2020-2023 (n=73; 96%) were deemed accidental by a pathologist.

Deaths related to stimulant use increased in all but three age groups (<20, 61-70, 71-80) and were generally highest for people between 41 and 60. A particularly worrying trend is the sharp increase in deaths in the 21-30 age group, from 1 death in 2021 and 2022 to 8 deaths in 2023. This uptick is especially concerning because young adults are especially vulnerable to substance misuse, as literature shows that stimulant misuse among young adults has been increasing nationally in recent years [30, 33, 37].

We characterized cocaine-related mortality in the province specifically as cocaine is the most common substance reported used among people who use drugs (PWUD) in Eastern Canada [33]. Indeed, a significant portion of the stimulant-related deaths in our sample (87.9%) involved cocaine, further supporting the importance of monitoring cocaine use and cocaine-related mortality separately in NL. Beyond just its high prevalence in the province, cocaine's adverse effects on physical health also warrant characterizing its use separately. It is well established that cocaine use can lead to significant toxic effects on an individual's cardiovascular system [20, 21]. Adverse cardiovascular effects are reflected in incurred healthcare costs. From 2015 to 2017, healthcare costs related to cocaine in the province of Newfoundland and Labrador increased by 37.4% from 2015 to 2017, while criminal justice costs increased by 17.9% [33].

Increases in deaths related to stimulant use have become a significant problem in recent years, according to the Canadian Centre on Substance Use and Addiction [33]. This increase in mortality is accompanied by an increase in stimulant use. Stimulant prescriptions, which aim to treat several conditions, have increased significantly since 2015 [9]. Availability of illicit stimulants has also increased in the past decade, as assessed by Health Canada's Drug Analysis Service (DAS), which determines the contents of drugs seized by law enforcement. The DAS reported significant increases in the presence of stimulants in seized samples from 2018 to 2021, including a 20% increase in the presence of cocaine [33].

While the rise in stimulant-related deaths mirrors increases in prescription stimulant use and the availability of cocaine in Canada, the increase in mortality is largely attributed to the increase in polydrug use, especially in combination with opioids [12]. This proposed connection is supported by the fact that since 2018, more than half of opioid toxicity deaths have also involved stimulants [34]. This recent rise in polydrug use involving stimulants and opioids is well documented [8, 19, 39, 40].

Another avenue for increasing trends in stimulant use is the increase in use of prescription stimulants. Regulated stimulants are often prescribed as a treatment for conditions such as ADHD, which may lead to nonmedical use of these substances or reliance on nonprescribed stimulants in the absence of a prescription [15, 16]. One meta-analysis found that among adult patients with ADHD, 10% were expected to develop cocaine use disorder over their lifetime [15]. Prescription of stimulants has increased in Canada in recent years and is highest among youth (15-19 years old) and young adults (20-24 years old), an age group that is especially vulnerable to substance misuse and one that shows concerning trends in our data [9, 16].

In the face of increasing healthcare demands, the cost related to stimulant use has increased notably in recent years. From 2014 to 2020, costs related to cocaine use increased by 30% to a figure of $4.16 billion, while costs related to other stimulant use increased by 67% to a figure of $3.06 billion [33]. These figures include a 15% increase in healthcare costs related to cocaine use and an 86% increase in healthcare costs for other stimulants [33].

6. Strengths & Limitations

This paper provides objective, measureable data which allows NL's stimulant toxicity prevalence to be compared to other provinces and territories in Canada. Our results have highlighted that cocaine continues to be a problematic catalyst to accidental and fatal stimulant toxicity in this province. There have been no results of this nature published to date; this paper showcases NL's stimulant use and adds to the knowledge of this public health topic. The limitations of this study are centered on the determination of manner of death by a forensic pathologist. The manner of death - accidental, suicide, homicide, nature, or undetermined - is designated by the forensic pathologist and includes review of medical charts and some self-reported data. As such, these determinations rely on holistic and completed charts to aid in an accurate rendering of the manner of death.

7. Conclusion

Significant increases in stimulant-related mortality warrant further study of stimulant use in the country and reinforce the need to identify effective policy solutions. Almost all (96%) stimulant-related deaths reported in NL from 2020-2023 were accidental, further justifying the need for the identification of relevant risk factors and effective initiatives aimed at reducing stimulant misuse. Understanding the motivations of individuals who use stimulants is a crucial step in developing robust policy solutions regarding stimulant-related mortality. Substance use is often highly intertwined with co-occurring mental health conditions and disorders, wherein people may

self-medicate to address symptoms [16, 29, 30, 37]. Considering that almost all stimulant toxicity deaths in Canada between 2018 and 2022 were accidental, a significant source of mortality may be an adulterated drug supply, where individuals are seeking stimulants but unintentionally consuming polydrugs containing opioids [33].

Abbreviations

ADHD	Aattention Deficit and Hyperactivity Disorder
HCV	Hepatitis C Virus
NL	Newfoundland and Labrador
OCME	Office of the Chief Medical Examiner
PWUD	People Who Use Drugs

Conflicts of Interest

The authors declare no conflicts of interest.

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