Mortality and Longevity

U.S. Drug Overdose Crisis—Past, Present, and Future:

A Dive into Trends and Drivers of Substance-Related Mortality

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U.S. Drug Overdose Crisis—Past, Present, and Future

A Dive into Trends and Drivers of Substance-Related Mortality

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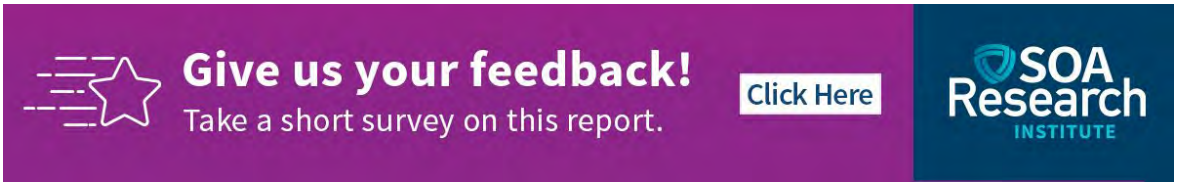

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U.S. Drug Overdose Crisis—Past, Present, and Future

A Dive into Trends and Drivers of Substance-Related Mortality

Executive Summary

Reinsurance Group of America, Incorporated (RGA) and the Society of Actuaries Research Institute (SOA) collaborated to investigate the trends and drivers behind drug overdose mortality and substance-related deaths as a whole. These investigations included a comprehensive medical literature review, discussions with experts, and analyses of both general and insured population datasets. Findings provided a range of insights surrounding substance use disorder, drug overdose and alcohol-induced mortality, and considerations for insurers.

For decades, drug overdose deaths have been increasing within the U.S., with opioid-related mortality driving this increase. The recent opioid overdose epidemic in the U.S. consisted of five primary stages driven by:

- the complex array of issues that led to widespread use of legal prescription opioids;
- the rise in heroin overdose deaths;
- the emergence of synthetic opioids, such as highly potent illicit fentanyl;
- the COVID-19 pandemic and the impacts of isolation and stress; and
- And the current post-pandemic environment.

Fentanyl remains the leading contributor of overdose deaths, but the presence of other – sometimes deadlier – substances mixed into drugs further contributes to the problem. Substances such as xylazine, carfentanil, and nitazenes are increasingly detected in overdose cases. These substances can make treating an overdose difficult, as they either do not respond to naloxone treatments or require significantly higher doses of the medication to respond. Despite this, available treatments and harm-reduction measures – many of which only recently became widely available in the U.S. – may be impacting mortality experience. After decades of increases, drug overdose deaths began to decline in 2023, and provisional data suggest further declines in 2024.

Certain demographic groups in the U.S. general population exhibit higher drug overdose mortality, including males, unmarried individuals, those with a lower level of educational attainment, and people working in construction-related occupations. The average age of death is also about 30 years younger for drug overdose deaths compared to that of all-cause mortality, with about 25%-30% of deaths for ages 25-39 being attributed to drug overdoses.

Substance-related mortality spans beyond drug overdose deaths. It is worth noting that alcohol use in the U.S. is more prevalent than illicit drug use (excluding marijuana); however, alcohol-induced mortality is lower than drug overdose deaths for the U.S. general population. Like drug overdose deaths, alcohol-induced mortality increased sharply during the acute phase of the COVID-19 pandemic, but it has decreased starting in 2022 and remains above 2019 levels. Interestingly, the university-educated population has recently experienced higher alcohol-induced deaths than drug overdose deaths. Additionally, in comparing drug overdose mortality to alcohol-induced mortality, the age of death is generally higher for alcohol-induced mortality, potentially due to its long-term impacts. Like drug overdose deaths, males also exhibited higher alcohol-induced mortality than females. However, due to differences in cause of death definitions, it is expected that total alcohol-related deaths are greater than the studied alcohol-induced deaths.

An analysis of RGA's proprietary data on drug- and alcohol-related claims in the insured population revealed additional insights. Insured experience had several similarities to that of the general population: Claims peaked in 2021 and have declined in recent years, and insured males exhibited higher drug- and alcohol-related mortality than insured females. Additionally, there was higher drug- and alcohol-related mortality in smokers, policies with face amounts below $100,000, and policies in their later durations. These analyses highlight the importance of considering differences in cause of death trends between the insured and general populations when setting mortality improvement assumptions. With recent underwriting practices and the degree of non-disclosure, it is also important for underwriters to "read between the lines" to identify potential substance use disorder based on a variety of clues within an application.

The U.S. has higher reported drug-related mortality than other countries, due in part to differences in the drug supply chain, regulations, and treatment availability, as well as a limited presence of supervised consumption sites relative to other countries. In particular, the U.S. prescription drug marketing and regulatory environment that fueled the epidemic was not seen in many other countries. An analysis of Canadian drug overdose mortality relative to the U.S. reveals a similar experience trend and age profile for deaths but with lower mortality rates.

While the future of the U.S. drug overdose crisis and overall substance-related mortality remains uncertain, recent decreases in mortality trends – potentially impacted by improvements in harm-reduction strategies – provide hope. However, the contamination of the drug supply chain and the emergence of other highly potent, illicit substances is an evolving situation and poses a major threat.

Section 1 Introduction

Drug use can include the consumption of legal or illegal substances. In the context of this report, *drug use* refers to the use of a controlled psychoactive substance for non-medical and non-scientific purposes. *Opioids* are a class of drugs that are natural, semi-synthetic, or synthetic and include prescription drugs and illegal drugs such as heroin. Oxycodone and hydrocodone, both semi-synthetic opioids, are commonly prescribed to treat pain. If misused, these can lead to dependence and adverse health consequences.[1]

Drug overdose deaths have been a leading contributor to premature mortality in the U.S. for many years, with the opioid crisis declared a "public health emergency" in 2017.[2] The recent overdose crisis was fueled originally by the intense marketing of prescription opioids, such as OxyContin, and advocacy campaigns for greater pain relief, which resulted in increased misuse of these drugs.[3] Certain state policies, such as those limiting prescription drug supply, have helped to reduce prescription opioid misuse. However, some of these policies may have inadvertently led some people with opioid use disorder (OUD) to purchase illicit opioids, which are often more powerful and deadlier.[4]

Today, the primary driver of drug overdose deaths is fentanyl, a synthetic opioid, as well as its chemically altered analogs.[5] Other potent substances, such as xylazine or nitazenes, are also increasingly mixed in the drug supply, increasing the risk of drug overdose and subsequent death.[6]

Taking a broader view of substance-related mortality, alcohol-induced deaths have also increased throughout recent decades. Rapid spikes in these deaths and increases in alcohol consumption were seen during the acute phases of the COVID-19 pandemic.[7]

In 2023, an estimated 48.5 million individuals aged 12 or older (17.1%) reported a past-year substance use disorder (SUD) on the National Survey on Drug Use and Health (NSDUH).[8] Various attributes can contribute to an individual's SUD, including a history of trauma, mental health disorders, negative peer influence, and a family history of SUD.[9] SUD is a chronic, lifelong relapsing condition. Relapses after withdrawal are quite common, particularly without effective maintenance treatment.[10]

Alcohol use disorder (AUD) and OUD are specific types of SUD, which are referenced throughout sections of this report. See Appendix A for definitions of each.

Section 2 Background of the U.S. Drug Overdose Crisis

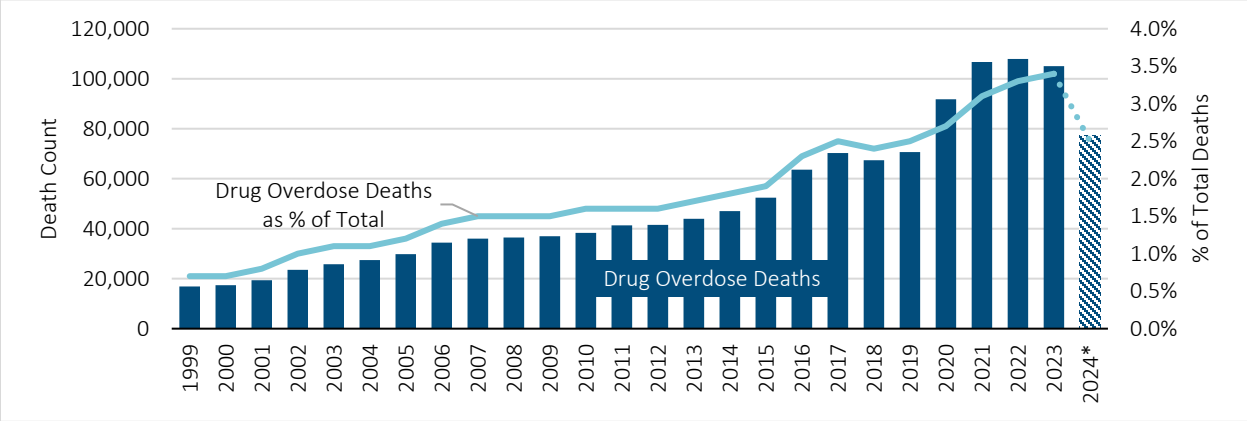
2.1 OVERALL TREND

U.S. general population data from the National Vital Statistics System (NVSS)[a] shows that drug overdose deaths have increased significantly in the past two decades. Between 1999 and 2022, the annual number of drug overdose deaths increased from about 17,000 to nearly 108,000 – a 540% jump. In terms of mortality rates, this is an increase from about 6.2 to 32.3 per 100,000 in the same period. As of 2023, this number dropped to approximately 105,000 (or a mortality rate of 31.2 per 100,000) (Figure 1). A report from the Centers for Disease Control and Prevention (CDC) noted a nearly 27% drop in provisional drug overdose death counts for 2024.[11] While the portion of total deaths due to drug overdoses continued to rise through 2023, it decreased in 2024.

[a] Refer to Appendix B for a description of the cause of death codes used within the analyses.

Figure 1

DRUG OVERDOSE DEATH COUNT AND % OF TOTAL DEATHS BY YEAR, U.S. GENERAL POPULATION, 1999-2024

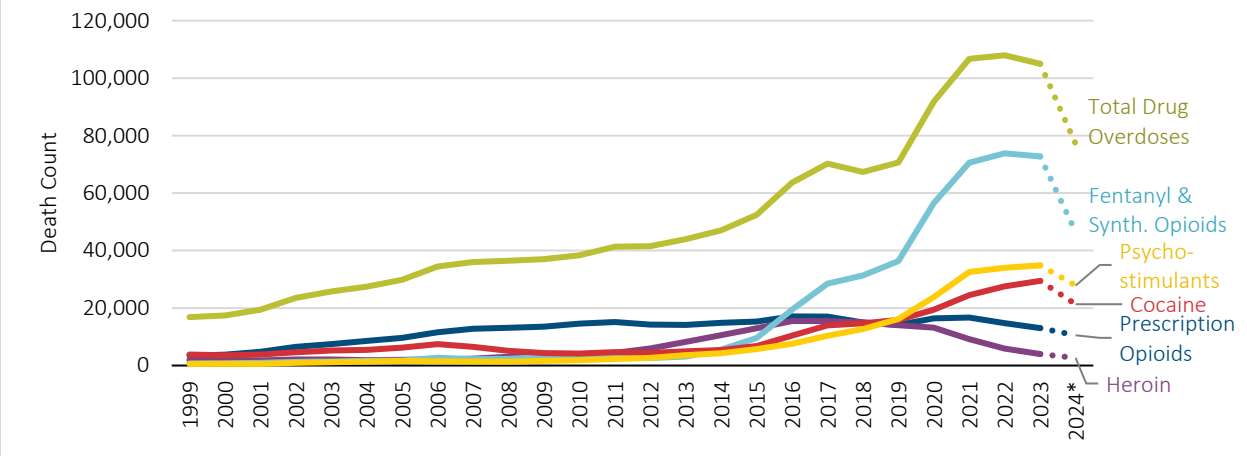


Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files.
*Data for 2024 is provisional, with deaths as of June 22, 2025.

2.2 WAVES AND DRIVERS

Figure 2

COUNT OF DRUG OVERDOSE DEATHS INVOLVING SPECIFIC DRUG TYPES BY YEAR, U.S. GENERAL POPULATION, 1999-2024



Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files.
*Data for 2024 is provisional, with deaths as of June 22, 2025.
Due to polydrug use, the sum of individual drug type deaths will not be equal to total drug overdose deaths.

The recent U.S. overdose crisis has consisted of several waves and drivers, many of which overlap.

2.2.1 PRESCRIPTION OPIOIDS

The current overdose epidemic was originally fueled by the targeted marketing, pain advocacy campaigns, and misrepresentation of risks associated with prescription opioid medications, such as OxyContin, in the treatment of chronic pain.[12,13] While there are many valid reasons to use pain relief medication, these systemic issues resulted in increased opioid misuse. Between 1999 and 2010, sales of prescription opioids quadrupled in the U.S.[14] Comparatively, other countries – which have notably lower opioid-related mortality – have more rigorous prescription guidelines and monitoring systems, as well as heavy regulations on the advertising of pharmaceutical

products.[15,16] While prescription opioid use is no longer a primary driver of overdose or opioid-related deaths, repeated misuse of such drugs could lead to an SUD.[17]

2.2.2 HEROIN

Around 2010, the main source of heroin for the U.S. shifted from South America to Mexico. As regulations restricted overprescribing opioids, some misusing these drugs turned to relatively cheap and increasingly available heroin, sparking a rise in heroin-related overdose deaths.[18,19] Between 2010 and 2016, the number of drug overdose deaths involving heroin increased five-fold from about 3,000 to nearly 15,500. In recent years, heroin's involvement in drug overdose deaths has declined.

2.2.3 SYNTHETIC DRUGS AND ILLICIT FENTANYL

Another wave of increasing opioid-related deaths began in 2013, driven by the use of illicit fentanyl. Today, drug overdose deaths are largely driven by fentanyl and fentanyl analogs. Fentanyl is highly potent. Less than two milligrams (mg) of fentanyl can be lethal, compared to about 100 mg of heroin or 250 mg of cocaine.[20] Fentanyl is often mixed with other substances – including heroin, cocaine, and methamphetamines – to increase potency and profit.[21] Fentanyl also is mixed into counterfeit anxiety and ADHD medications, such as fake Xanax or fake Adderall, posing additional concern for unknowing populations.[22] Between 2013 and 2022, the percentage of drug overdose deaths involving fentanyl and synthetic opioids rose from 7% to nearly 70%. Deaths from illegally manufactured fentanyl (IMF) began to decline in 2023 and were 7.8% lower during the second half of the year compared to the same period in 2022.[23] This could perhaps be related to the "burnout theory" – that high-risk users may have already died and those remaining are more aware of the dangers.[24]

2.2.4 STIMULANTS

From 2010 to 2023, overdose deaths involving cocaine rose from 11% to 28%, and those involving psychostimulants with abuse potential, such as methamphetamines, rose from 5% to 33%. Much of this increase appears to be related to the co-involvement with IMF.[25] Stimulants and synthetic opioids are increasingly co-involved in drug overdose deaths, potentially motivated by effects on functionality and alertness.[26]

2.2.5 COVID-19 PANDEMIC

Rising drug overdose deaths began to flatten out in 2018, and there was hope they might begin to decline. However, overdose deaths further spiked in 2020, timed with the start of the COVID-19 pandemic, primarily due to fentanyl. Part of this surge may be attributable to pandemic-related isolation and its impact on mental health, particularly among adolescents.[27,28]

2.2.6 POLYSUBSTANCE USE AND DRUG CONTAMINATION

Polysubstance use encompasses both intentional and unintentional consumption of multiple drugs and has contributed to drug overdose deaths for many years, as seen with the contamination of illicit fentanyl in other substances. A person may intentionally use multiple drugs to alter the effects of the substances involved. Using multiple drugs or the combination of drugs and alcohol heightens the chance of overdose and organ damage. Unintentional drug use involves the use of drugs that have been mixed with other substances, without the user's knowledge.[29] Drugs are increasingly mixed with other substances, including xylazine, carfentanil, medetomidine, and nitazenes – some of which may be added to increase potency or profits for drug traffickers.[30,31,32]

Xylazine, carfentanil, and medetomidine are all used within the veterinary industry and have been increasingly involved in drug overdose deaths. These substances are quite potent – some even more potent than fentanyl – and may not respond well or at all to naloxone, a medication used to reverse an opioid overdose.

Novel synthetic opioids such as nitazenes are among the fastest-growing substances detected in emergency department overdose cases. They are often significantly more potent than fentanyl, requiring higher doses of naloxone to treat. Their increasing use may be an unintended consequence of stricter fentanyl regulations, potentially positioning nitazenes as the "new fentanyl" in their impact on substance-related mortality.[33]

Contamination of the illegal drug supply chain with novel substances is an ever-evolving, fluid situation and one that has high potential to impact the overdose mortality trend in the future.

2.2.7 DRUG SUPPLY

Drug seizures by the U.S. Drug Enforcement Administration (DEA) provide some indication of the prevalence of illegal drugs. Several studies using data from the DEA's National Forensic Laboratory Information System have identified a positive relationship between drug seizures and overdose deaths. In one study, from 2014 to 2019, each additional fentanyl and fentanyl-related compound seizure was associated with a 2.97% increase in opioid overdose death rates per quarter.[34] Therefore, drug seizures could serve as an early-warning sign to predict opioid overdose deaths. The correlation is perhaps counterintuitive, as one may envision seizures as tightening supply, but it also could be viewed as a signal of high drug traffic.

Section 3 Demographic Differences in U.S. General Population Drug Overdoses

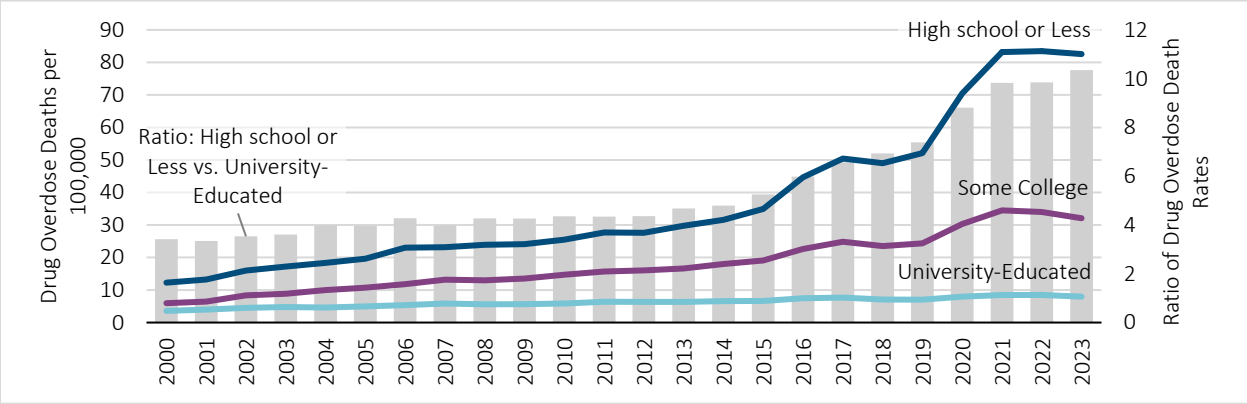
SUD and drug overdose deaths vary by demographic group, including level of education, age, sex, marital status, and occupation. Analysis by demographic groups and other cohorts, while not a perfect representation of the insured population, can provide some insights into how population trends may impact the insured experience.

3.1 EDUCATION

Opioid users tend to have lower levels of education than non-users.[35] In 2000, individuals with high school or less education had drug overdose mortality rates about three times higher than those of university-educated individuals; this differential grew to a factor of ten in 2023. In recent years, individuals with lower education levels have a higher portion of drug overdose deaths involving fentanyl and other synthetic opioids, as well as stimulants, compared to those with higher education levels. As of 2023, all education levels appear to have decreasing drug overdose mortality relative to 2022. This is worth noting when assessing this impact on insured populations, as the experience from higher education levels in the general population can potentially serve as a proxy to that of a fully underwritten insured population (Figure 3).

Figure 3

DRUG OVERDOSE DEATH RATES BY EDUCATION LEVEL, U.S. GENERAL POPULATION, AGE 25+, 2000-2023



Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files and population data from the U.S. Census Bureau.

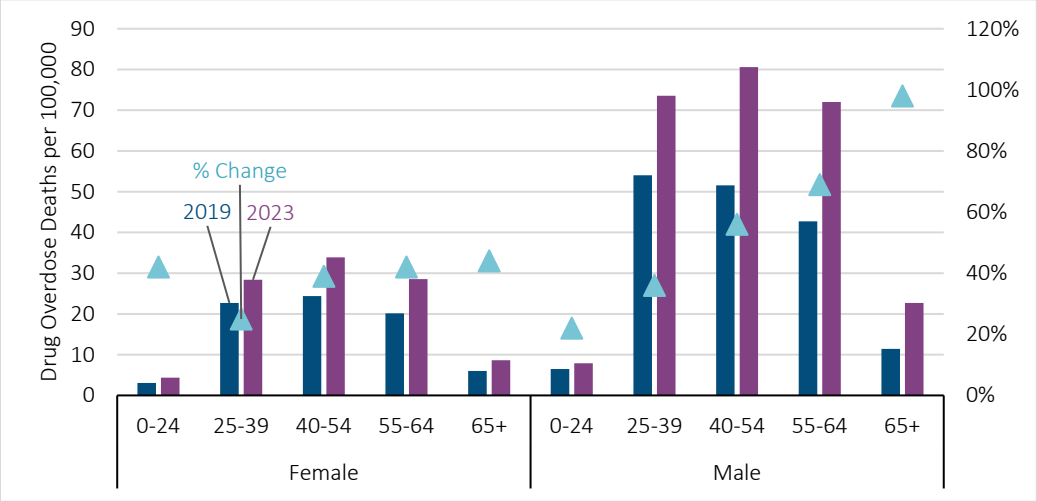
3.2 AGE AND SEX

Drug overdose death rates differ greatly by age and sex. Figure 4 shows that males and people aged 25-64 had the highest rates of drug overdose deaths in 2023. All studied age and sex pairings also exhibited higher drug overdose death rates in 2023 compared to 2019. However, most of these pairings had lower drug overdose death rates in 2023 compared to 2022, with younger ages showing the largest decreases. Notably, older ages exhibited the largest percentage increases in drug overdose mortality rates, with males aged 65+ having 98% higher drug overdose mortality rates in 2023 compared to 2019.

Figure 5 assesses the relationship of drug overdose deaths to the total deaths by age-sex cohort. An additional alarming finding shows that around 25%-30% of all deaths for ages 25-39 were attributed to drug overdoses in 2023. This age-specific skew in drug overdose deaths contributes to an average age of death of 45 years old – about 30 years less than the average age of death across all causes in 2023.

Figure 4

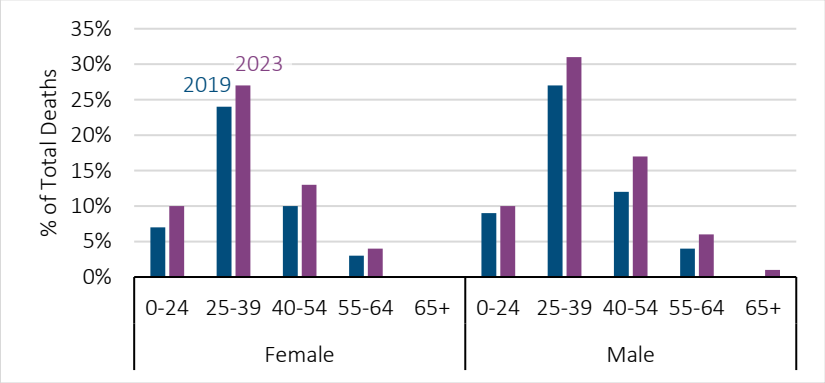
DRUG OVERDOSE DEATH RATES BY SEX AND AGE, U.S. GENERAL POPULATION, 2019 VS. 2023



Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files and population data from the U.S. Census Bureau.

Figure 5

DRUG OVERDOSE DEATHS AS % OF TOTAL DEATHS BY SEX AND AGE, U.S. GENERAL POPULATION, 2019 VS. 2023



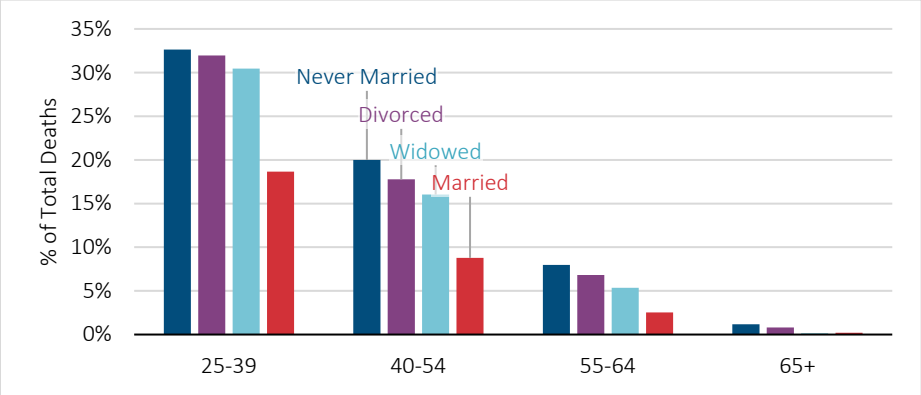
Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files and population data from the U.S. Census Bureau.

3.3 MARITAL STATUS

Never-married individuals have the highest portion of deaths due to drug overdoses of all marital statuses. Individuals who were divorced or widowed also exhibited disproportionately higher drug overdose deaths than their married counterparts. This insight holds true for all age groups studied (Figure 6). As marital status can relate to insurable interest in certain markets, these differences provide additional insights for insurers.

Figure 6

DRUG OVERDOSE DEATHS AS % OF TOTAL DEATHS BY MARITAL STATUS AND AGE, U.S. GENERAL POPULATION, AGE 25+, 2023



Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files. Data for ages 0-24 was excluded due to credibility concerns for certain marital statuses.

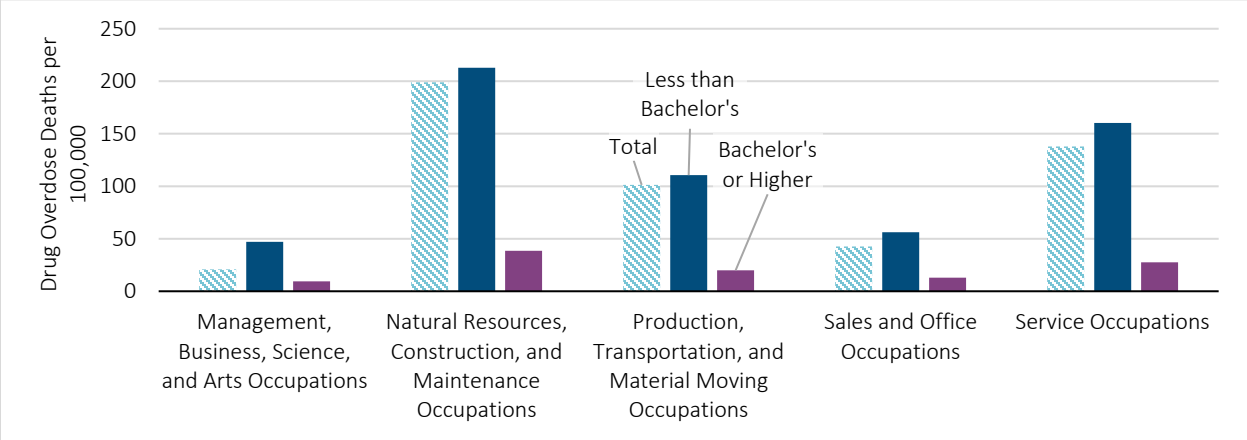
3.4 EMPLOYMENT AND OCCUPATIONAL TYPE

Studies have found a relationship between opioid use and both social isolation and unemployment. Opioid users are less likely to have opportunities for employment and, thus, people who use opioids have higher rates of unemployment – up to 87% for severely addicted people seeking methadone maintenance.[36] Reports suggest that unemployed individuals have a 40% increased risk of opioid misuse compared to employed individuals working normal hours (35-40 hours per week).[37]

Experience also varies by type of employment, although the relationship is likely not independent of other demographic correlations. For example, occupations with a high percentage of younger male workers tend to have higher rates of SUDs.[38] Individuals working in natural resources, construction, maintenance, and service occupations experience the highest drug overdose mortality rates, while occupations related to management, business, and sales experience the lowest rates (Figure 7). One potential reason for this difference in experience by occupation could relate to work-related injuries, which vary by occupation, as opioids are commonly prescribed for certain injuries.[39,40]

Figure 7

DRUG OVERDOSE DEATH RATES BY OCCUPATION AND EDUCATION, U.S. GENERAL POPULATION, AGES 25-64, 2023



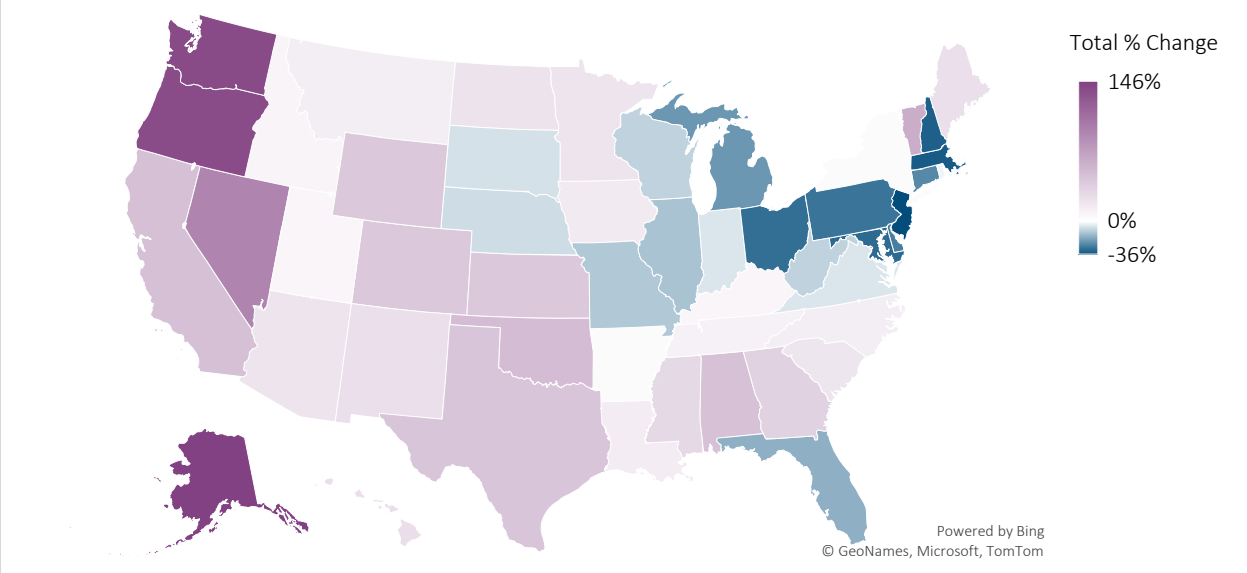
Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files and population data from the U.S. Census Bureau. Note: The latest population data available was from 2022, so mortality rates are based on 2023 deaths and 2022 population counts.

3.5 GEOGRAPHY – U.S. STATE

Drug overdose deaths vary greatly by region, with West Virginia and Washington, D.C. having the highest drug overdose mortality rates in 2023. Geographic trends in drug overdoses since the COVID-19 pandemic have also changed, with drug overdoses in Eastern states peaking earlier than in Western states.[41] Comparing annual drug overdose deaths for the 12 months ending December 2019 and December 2024 shows how recent drug overdose mortality compared to pre-pandemic levels by state. Many Eastern states have dropped below pre-pandemic levels – some by as much as 36%. Several states, particularly in the West, remain above pre-pandemic levels. Oregon, Washington, and Alaska have recent drug overdose death rates approximately 130% to 150% higher than those in the same period in 2019 (Figure 8).

Figure 8

PERCENT CHANGE IN ANNUAL PREDICTED DRUG OVERDOSE DEATH RATES BETWEEN 12-MONTH PERIOD ENDING IN DECEMBER 2019 VS. DECEMBER 2024



Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, Vital Statistics Rapid Release provisional predicted drug overdose deaths and population data from the U.S. Census Bureau. Deaths are based on the jurisdiction in which they occurred.

Geographic disparities can be influenced by a variety of socioeconomic factors – income inequality can impact the ability to have stable housing, reliable transportation, and health insurance, all of which can affect access to treatment and support.[42] Differences by state can also be related to treatment availability, legality of drug checking equipment, and regulatory changes. For example, Oregon voted to decriminalize possession of all illicit drugs in 2020 in an effort to destigmatize their use and encourage individuals to seek treatment. This decision was reversed in 2024.[43,44]

3.6 MENTAL ILLNESS

"Deaths of despair" – which include fatalities from suicide, drug overdose, and alcohol-related disease – are so-called to reflect the mental health comorbidity. Individuals with a mental illness have a high prevalence of SUD. In 2023, about one-third of adults with any mental illness (AMI) had an SUD. Adults with a severe mental illness (SMI) or AMI were more likely to use illicit drugs in the past year compared to those with no mental illness – 51.9% for SMI, 42.4% for AMI, and 21.0% for those with no mental illness. Adults with SMI or AMI were also more likely to misuse opioids and binge alcohol than those with no mental illness.[45]

There are a few reasons why mental illness and SUDs are related. They have common risk factors, such as trauma, adverse social environments, or inherited characteristics. Mental disorders may also lead to drug use for symptom relief. Substance use may even contribute to the development and worsening of mental disorders.[46] Likewise, individuals may be prescribed benzodiazepines, which are highly addictive and can lead to SUD for alcohol withdrawal or anxiety.[47]

The American Psychology Association's Stress in America survey notes that long-term stress since the beginning of the COVID-19 pandemic has had significant impacts, with an increase in mental health diagnoses from 31% to 45% for adults aged 35-44 between 2019 and 2023.[48] Such trends in mental health create concerns about the impact on future SUD rates.

Section 4 Alcohol Use

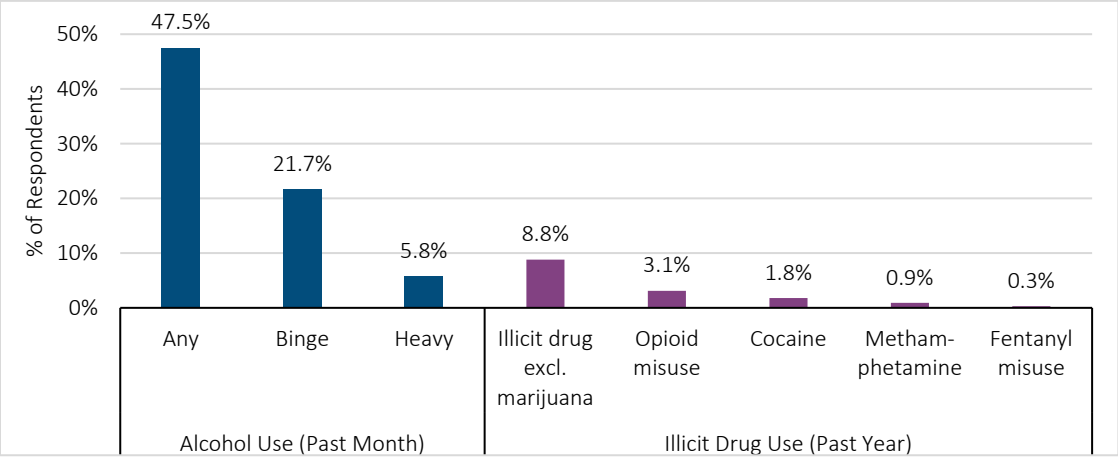
4.1 ALCOHOL CONSUMPTION TRENDS AND IMPLICATIONS

Globally, alcohol is the most widely used psychoactive substance, with 44% of the world's population aged 15 and over having consumed it in 2019.[49] It is responsible for approximately 5% of global deaths annually and is the leading cause of death and disability in those aged 15-49 years.[50] Among individuals drinking harmful amounts of alcohol in 2020, 59.1% were aged 15-39 years, and three-quarters (76.9%) were male.[51] In 2023, an estimated 28.9 million people in the U.S. aged 12 and older had a past-year alcohol use disorder (AUD).[52]

In the U.S., the 2023 NSDUH showed that approximately 47.5% of respondents aged 12 and older had used any alcohol, 21.7% binged alcohol, and 5.8% reported heavy use of alcohol in the past month.[b] This compares to 8.8% who indicated illicit drug use (excluding marijuana) within a year of being interviewed (Figure 9).[53]

Figure 9

SUBSTANCE USE PREVALENCE BY VARIOUS SUBSTANCES IN THE U.S., AGE 12+



Source: Data from National Survey on Drug Use and Health, 2023.

Alcohol consumption is linked to multiple diseases, including:

- Cardiovascular disease
- Liver disease such as cirrhosis
- Other gastrointestinal complications
- Certain cancers, including colon, liver, and breast cancer[54]

Alcohol consumption increased as much as 25% in the U.S. at the start of the pandemic. Concerns remain that this initial increase could be the start of a long-term trend in excess alcohol consumption, particularly considering cases of alcohol-associated liver disease were already rising pre-pandemic.[55]

[b] NSDUH defines binge alcohol use as "consumption of four or more drinks on the same occasion for females and five or more drinks on the same occasion for males on at least 1 day in the past 30 days." Heavy alcohol use is defined as "binge drinking on 5 or more days in the past 30 days." The percentages of respondents reporting each "level" of alcohol use are based on the same population. Thus, individuals who reported heavy alcohol use also reported binge and any alcohol use, but those who reported any alcohol use did not necessarily report binge or heavy use.

4.2 ALCOHOL-INDUCED MORTALITY TRENDS

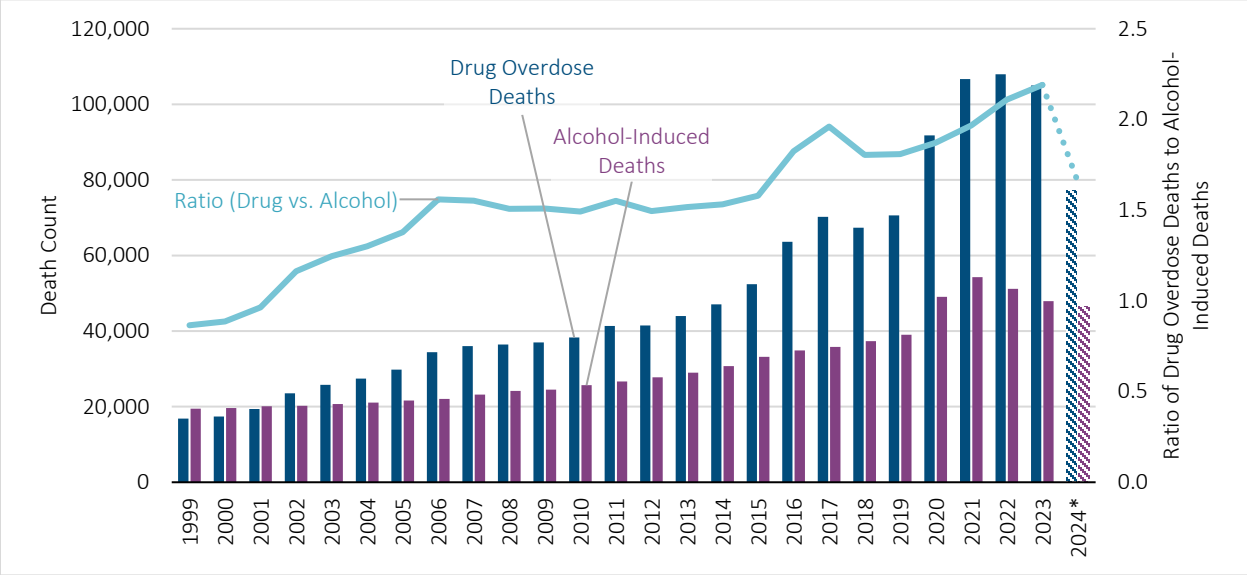
4.2.1 OVERALL TREND

Assessing alcohol-induced death trends in the U.S. indicates a generally increasing trend, with larger increases coinciding with the COVID-19 pandemic. Within the U.S. general population, drug overdose deaths have exceeded alcohol-induced deaths for decades, with the gap widening over time. Notably, there was a decrease in alcohol-induced deaths in 2022 and 2023; however, those deaths were still above pre-pandemic levels (Figure 10).

It is important to note that a large portion of alcohol-related deaths are not classified as alcohol-induced. See Appendix B for details on the cause of death definitions used in this analysis. A CDC report indicated over 178,000 annual alcohol-related deaths in the 2020-2021 period[56] – much higher than drug overdose deaths during that time.

Figure 10

DRUG OVERDOSE DEATHS VS. ALCOHOL-INDUCED DEATHS, U.S. GENERAL POPULATION, 1999-2024



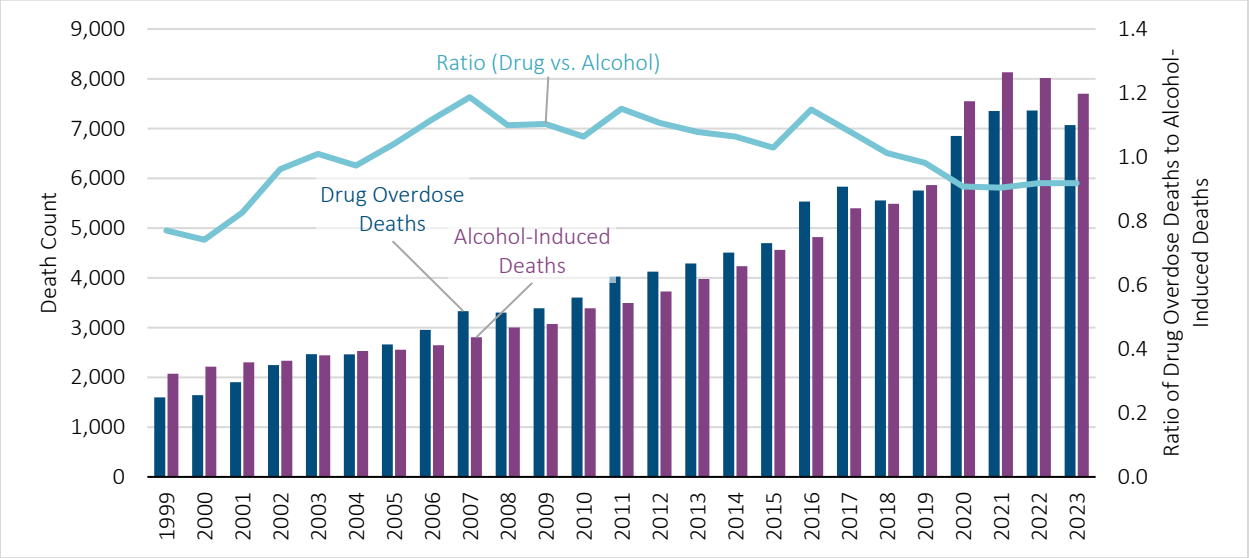
Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files.
*Data for 2024 is provisional, with deaths as of June 22, 2025.

4.2.2 EDUCATION LEVEL

There are notable differences in mortality experience between drug overdose deaths and alcohol-induced deaths of university-educated individuals compared to the wider general population. When limiting the analysis to only individuals with at least a bachelor's degree, a new trend emerges: Drug overdose deaths and alcohol-induced deaths are significantly closer, with alcohol-induced deaths surpassing drug overdoses starting in 2019 (Figure 11). Similar to Figure 10, alcohol-induced deaths decreased slightly in the past two years of data, with 2023 still above pre-pandemic levels. However, because alcohol-induced deaths represent only a portion of all alcohol-related deaths, the true number of alcohol-related deaths is likely even higher than presented in Figures 10 and 11.

Figure 11

DRUG OVERDOSE DEATHS VS. ALCOHOL-INDUCED DEATHS, U.S. GENERAL POPULATION WITH BACHELOR'S DEGREE OR HIGHER, 1999-2023



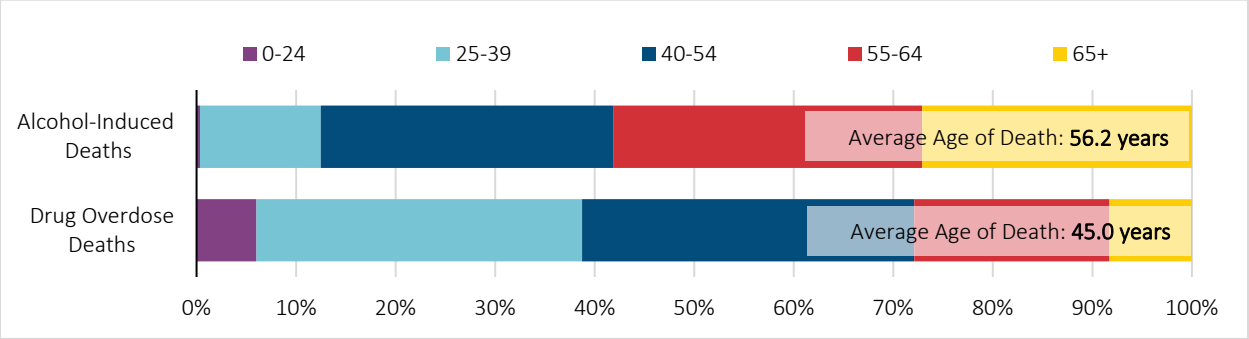
Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files. Provisional data for 2024 is not available on education levels.

4.2.3 AGE

There are relevant differences in mortality experience by age when comparing drug overdose deaths to alcohol-induced deaths. Most notably, alcohol-induced deaths are frequently due to chronic conditions such as alcoholic liver disease and other long-term impacts of alcohol consumption. As a result, alcohol-induced deaths are more prevalent than drug overdose deaths at older ages, while the inverse relationship exists for younger ages (Figure 12).

Figure 12

AGE DISTRIBUTION OF DEATHS AND AVERAGE AGE OF DEATH BY CAUSE, U.S. GENERAL POPULATION, 2023



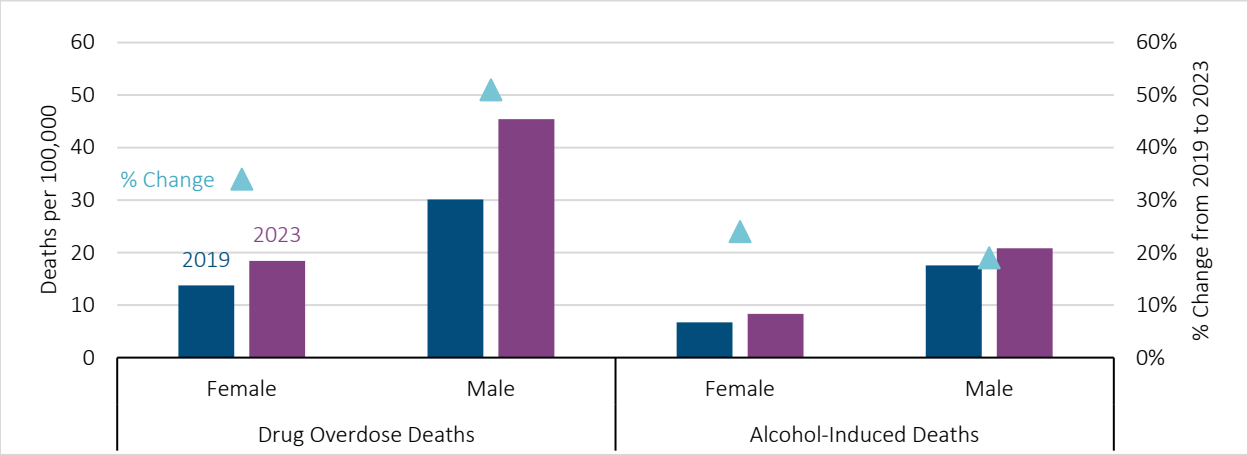
Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files.

4.2.4 SEX

Last, studying the difference in alcohol-induced mortality compared to drug overdose mortality by sex reveals some post-pandemic changes. Males have a higher mortality rate for drug overdose and alcohol-induced causes. While males have a higher percentage change in the mortality rate for drug overdoses between 2019 and 2023 (51% vs. 34%), females have a larger change for alcohol-induced causes (24% vs. 19%) (Figure 13).

Figure 13

DRUG OVERDOSE AND ALCOHOL-INDUCED DEATH RATES BY SEX, U.S. GENERAL POPULATION, 2019 VS. 2023



Source: RGA analysis of National Center for Health Statistics, National Vital Statistics System, mortality data files and population data from the U.S. Census Bureau.

Section 5 U.S. Insured Drug- and Alcohol-Related Mortality Trends

While general population data offers a detailed, credible overview of substance-related mortality trends in the U.S., translating these findings to the insured population remains challenging. RGA leveraged its extensive insured data to bridge this gap, enabling a more accurate understanding of substance-related mortality trends specific to the insured population.

5.1 DATA DESCRIPTION

RGA conducted an analysis on individual life insurance claims using a combined cause of death denoted "Alcoholism/Drug Overdose." The analysis covers different demographic factors and policy characteristics. Due to the known differences in underlying mortality experience by underwriting type, only fully underwritten policies were included. The fully underwritten dataset includes over 6,900 total drug- and alcohol-related claims over the study period 2011 to 2023. See Appendix C for more details on this dataset.

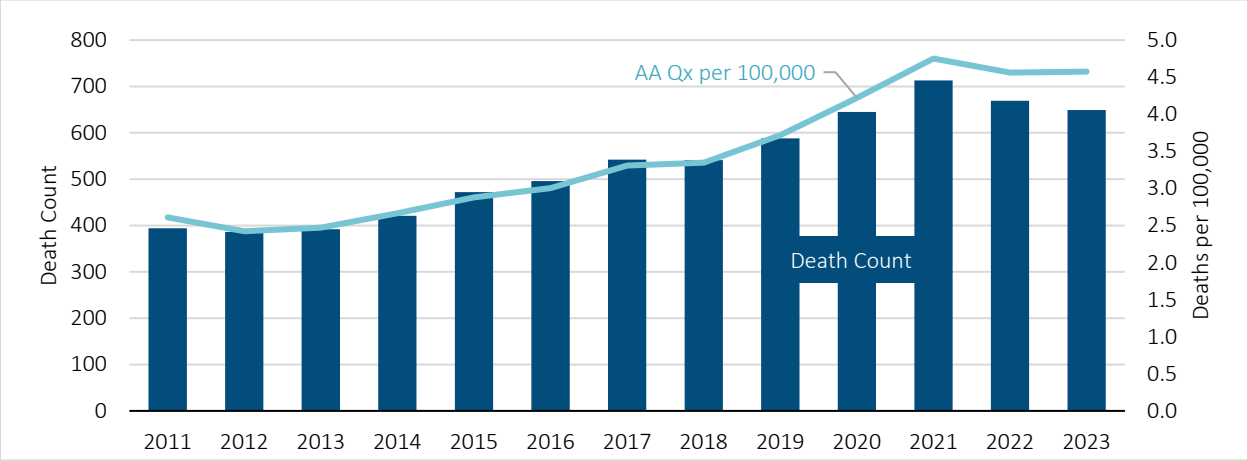
5.2 MORTALITY ANALYSES

5.2.1 OVERALL TREND

The age-adjusted drug- and alcohol-related mortality rate for fully underwritten business increased steadily from 2012 through 2021. An encouraging drop in 2022 was followed by a leveling off in 2023. The pre-pandemic period of 2012 through 2019 had a 6% annualized increase. This rose to 13% between 2019 and 2021. Since the peak in 2021, mortality rates have dropped 2% per year, on average (Figure 14).

Figure 14

AGE-ADJUSTED DRUG- AND ALCOHOL-RELATED DEATHS AND MORTALITY RATES, U.S. INSURED DATA, 2011-2023



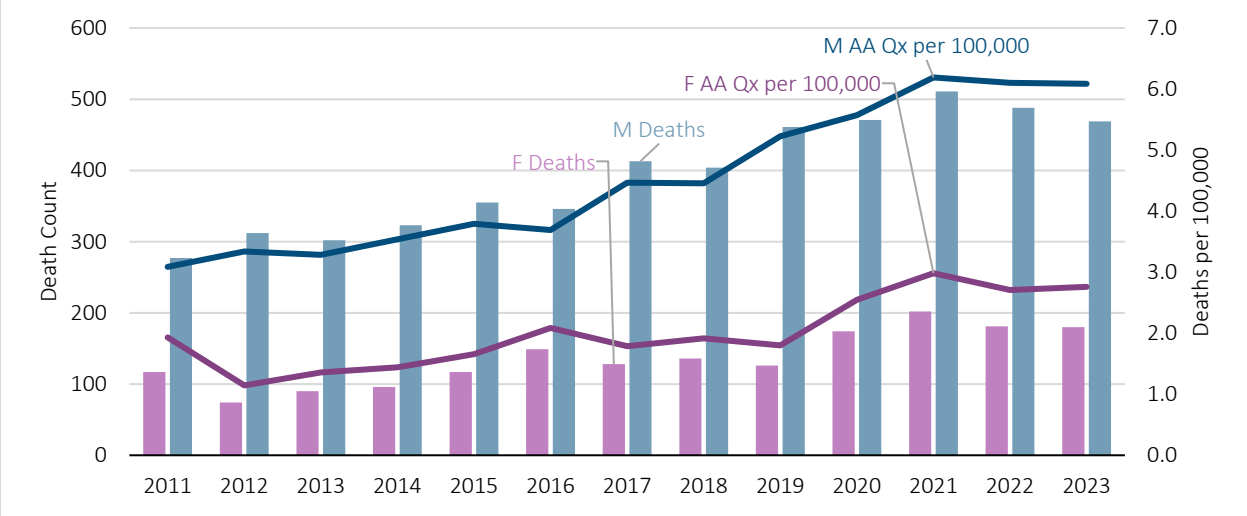
Source: Analysis of RGA proprietary insured data, limited to fully underwritten policies.

5.2.2 GENDER

Similar to the general population, insured males consistently had a higher drug- and alcohol-related mortality rate than females. These deaths also represented a higher proportion of total deaths for males than females. However, between 2019 and 2021, females experienced a larger annual increase in drug- and alcohol-related mortality rates – 29% compared to 9% for males. Similarly, females also saw a larger decrease from 2021 to 2023 – 4% vs. 1% annually (Figure 15).

Figure 15

AGE-ADJUSTED DRUG- AND ALCOHOL-RELATED DEATHS AND MORTALITY RATES BY GENDER, U.S. INSURED DATA, 2011-2023



Source: Analysis of RGA proprietary insured data, limited to fully underwritten policies.

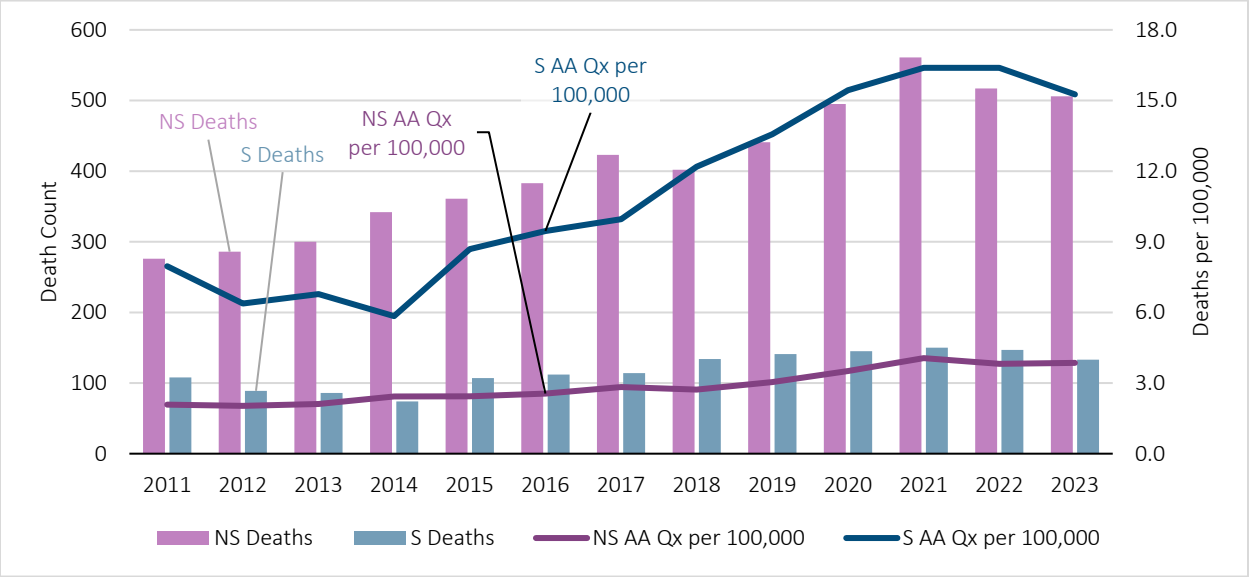
5.2.3 SMOKER STATUS

Smokers consistently had a higher drug- and alcohol-related mortality rate than non-smokers. Drugs and alcohol also consistently represented a higher proportion of total deaths for smokers. Between 2021 and 2023, both smokers and non-smokers exhibited decreasing or level trends in drug- and alcohol-related mortality rates (Figure 16).

A study using data from the NSDUH found a significant correlation between cigarette smoking and opioid misuse, with current smokers showing a higher incidence (1.35%) compared to non-smokers (0.67%), as well as a greater likelihood of initiating opioid misuse (adjusted odds ratio of 1.81).[57] Similarly, smokers are nearly three times more likely to drink heavily than non-smokers.[58]

Figure 16

AGE-ADJUSTED DRUG- AND ALCOHOL-RELATED DEATHS AND MORTALITY RATES BY SMOKER STATUS, U.S. INSURED DATA, 2011-2023



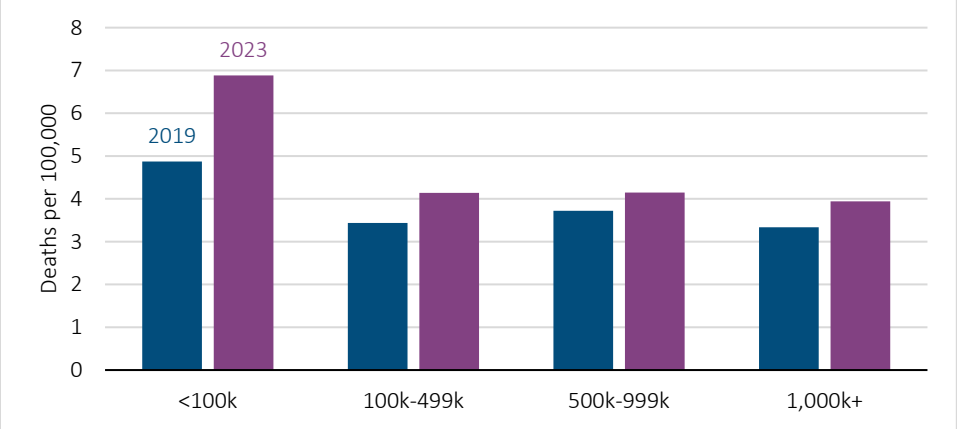
Source: Analysis of RGA proprietary insured data, limited to fully underwritten policies.

5.2.4 FACE AMOUNT

Small face policies (less than $100,000) generally had a higher drug- and alcohol-related mortality rate than larger face policies (Figure 17). This could be related to the socioeconomic correlation to face amount, or it could occur because more relaxed underwriting that does not require blood testing for lower face bands may attract a different applicant pool. The age-adjusted drug- and alcohol-related mortality rates are similar for each of the three face bands above $100,000. All face bands show higher drug- and alcohol-related mortality rates in 2023 compared to 2019.

Figure 17

AGE-ADJUSTED DRUG- AND ALCOHOL-RELATED MORTALITY RATES BY FACE AMOUNT, U.S. INSURED DATA, 2019 VS. 2023



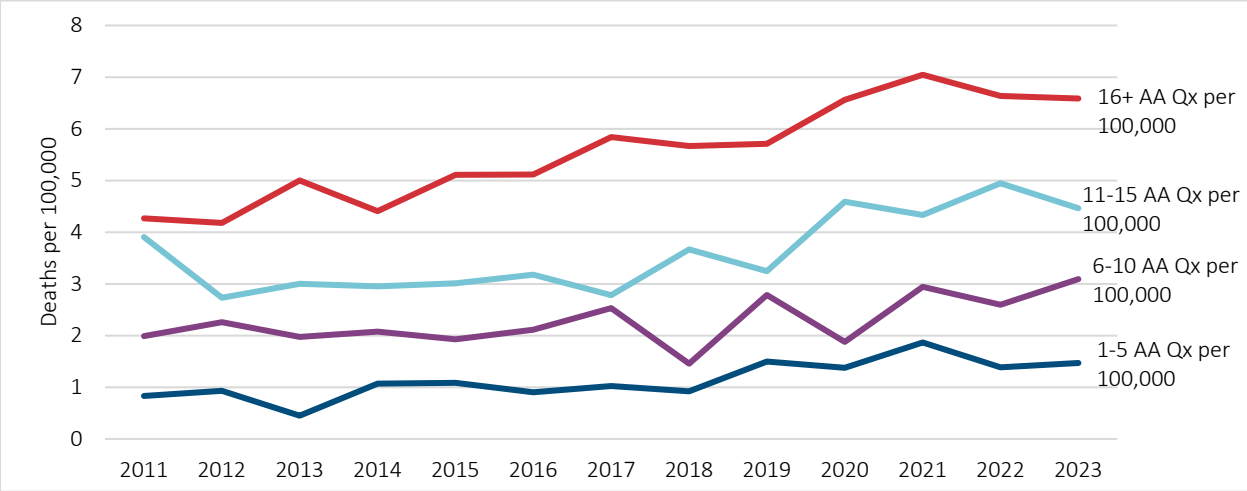
Source: Analysis of RGA proprietary insured data, limited to fully underwritten policies.

5.2.5 POLICY DURATION

Claims were also analyzed by policy duration to understand the risk selection provided by underwriting. As expected, later-duration policies consistently had higher age-adjusted drug- and alcohol-related mortality rates than earlier-duration policies, indicating the early protective effects of underwriting (Figure 18).

Figure 18

AGE-ADJUSTED DRUG- AND ALCOHOL-RELATED MORTALITY RATES BY POLICY DURATION (YEARS), U.S. INSURED DATA, 2011-2023



Source: Analysis of RGA proprietary insured data, limited to fully underwritten policies.

5.3 IMPLICATIONS AND CONSIDERATIONS FOR INSURERS

Insurer risk increases as fewer applications require fluid testing in a move to better align underwriting processes with consumer demands. Such testing, including urine screening, provides a more complete snapshot of drug use for the substances being targeted. When indicated, additional questionnaires on mental health, alcohol use, and drug use can help fill gaps, but self-reporting presents its own challenges. Medical records may provide further details, as may motor vehicle records for accident history.

> "*It is important for underwriters to be trained to 'read between the lines' and notice medical, social, and behavioral clues that may indicate a potential substance use disorder, especially given the current societal trends in drug use*." – Dr. Georgiana Willwerth, VP & Medical Director - Global Medical, RGA

Some red flags may be more obvious than others. Potential clues include a history of trauma, mental illness, extended sick leave, or accidents. Medical signs – such as a history of hypertension, palpitations, gout, gastrointestinal issues, or liver function test abnormalities – raise more red flags. Prescription drug history – particularly the number of prescriptions or prescribers, duration, and frequency of prescription renewals – could also raise concerns about prescription drug misuse.

These analyses highlight the importance of considering differences in the cause of death trends between general population and insured lives when setting mortality improvement assumptions. Use of consistent definitions and age-standardization provides a clearer picture of the scope of the problem and the real trends in insured lives. Twenty years ago, overdose deaths were largely an afterthought for fully underwritten lives. Today, that cause has grown to have real influence on all-cause mortality trends. Still, the growing volume of substance-related deaths has had a bigger impact on general population mortality deterioration than in the insured population. When making comparisons, two important factors to note are:

1. Cause of death definitions may differ between the insured and general population datasets.
2. There will be differences in the demographic mix between the insured and general population datasets.

These factors and the underlying drivers behind substance-related mortality trends are important to acknowledge when conducting trend analysis or setting assumptions.

Section 6 Treatments and Intervention Strategies

SUD treatments and related policies aimed at improving accessibility and effectiveness of interventions have experienced several significant developments in recent years. These changes span various treatment types and are likely to impact substance-related mortality trends.

6.1 MEDICATION-ASSISTED TREATMENTS

Drugs such as methadone, naltrexone, and buprenorphine are considered medication-assisted treatments (MATs) that aim to help individuals reduce or discontinue opioid or alcohol use. Such treatments help reduce the risk of relapse.[59] Historically, MATs have faced hurdles with limited availability and restricted access in the U.S.,[60] while some countries in Europe have had MATs available since the 1970s,[61] with over half of high-risk opioid users in the European Union receiving opioid agonist treatment in 2023.[62] However, recent policy changes, notably the removal of the DEA X-waiver requirement for buprenorphine prescriptions in January 2023, have improved accessibility in the U.S.[63]

6.2 OVERDOSE REVERSAL MEDICATIONS

Access to opioid overdose reversal medications such as naloxone and nalmefene[c] is another harm-reduction measure. Italy reclassified naloxone as an over-the-counter medicine in 1996. Other European countries, including the U.K. and Germany, have increased distribution of take-home naloxone kits. The U.S., on the other hand, was slower to provide broader access but recently made such treatments more accessible.[64] From 2022 to 2024, key developments included FDA approvals for over-the-counter use of naloxone nasal spray (Narcan),[65] a nalmefene nasal spray (Opvee),[66] a second over-the-counter naloxone nasal spray (RiVive),[67] and a new nalmefene auto-injector (Zurnai) with a longer half-life.[68] These approvals have expanded the range of available options, introducing over-the-counter access and formulations with improved efficacy. Increased accessibility represents a crucial step in combating opioid-related mortality, potentially enabling faster and more effective responses to overdose situations.

6.3 DRUG CHECKING EQUIPMENT

Fentanyl and xylazine test strips are examples of drug checking equipment (DCE) to help users identify contaminants in drugs. Previously classified as illegal drug paraphernalia, all forms of DCE are now legal to sell, give away, and possess in nearly half of the states,[d] and federal funding is available for their purchase. Surveys suggest that individuals adjust their overdose risk behavior if they receive a positive result on a fentanyl test strip – by taking smaller amounts of the drug or using it more slowly.[69]

6.4 GLP-1 DRUGS

Originally developed for diabetes treatment and later used to treat obesity, GLP-1 drugs show promise in addiction treatment. Injectable GLP-1 drugs mimic the hormone GLP-1 and are expressed in areas of the brain influenced by addictive drugs such as opioids and alcohol. Recent studies associate them with reduced risk of various SUDs. While further research is needed, these drugs represent a potential new frontier in addressing addiction.[70,71,72]

[c] Naloxone is an FDA-approved opioid overdose reversal medication, often available in the form of nasal spray or injection. Nalmefene is an opioid antagonist designed to be used in a healthcare setting.
[d] Laws of DCE vary for possession vs. free distribution, as well as the type of DCE (e.g., fentanyl, xylazine, all).

6.5 SUPERVISED CONSUMPTION SITES

Supervised consumption sites (SCSs)[e] allow substance users to inject pre-obtained drugs in a supervised environment.[73] Nearly 200 such sites exist globally, with centers in Europe, Australia, and Canada in operation – some for more than three decades. In contrast, the U.S. did not open an SCS until 2021 and currently has only three active sites – two in New York City and one in Providence, Rhode Island. Studies to date show that SCSs save lives;[74,75] however, some controversy may remain around the populations served and the durability of treatment effects.[76,77]

6.6 OTHER OPTIONS

The above interventions are not an exhaustive list. Additional measures include drug awareness campaigns and education, the use of opioid settlement funds to address this public health crisis, syringe service programs, treatment initiation in emergency departments, and non-opioid pain treatment options.[78]

These policy changes, treatment innovations, and harm-reduction strategies aim to enhance the range and effectiveness of SUD interventions, potentially leading to significant reductions in drug-related mortality trends.

[e] Other common terms for supervised consumption sites include *overdose prevention centers/sites*, *supervised injection facilities*, or *drug consumption rooms*.

Section 7 A Global Perspective

According to data from the Institute for Health Metrics and Evaluation, the U.S. had the highest death rates attributed to drug use as of 2021.[79] Key differences contribute to OUDs and the opioid overdose epidemic in the U.S. compared to other regions.

Prescription guidelines and regulations, treatment availability and accessibility, and the prevalence of supervised consumption sites were all highlighted as potential drivers in the differences in substance-related deaths between the U.S. and other countries. Aside from these, additional key drivers exist.

7.1 SUPPLY CHAIN DIFFERENCES

Significant regional differences exist in supply and demand for drugs. The U.S. drug trade is significantly influenced by the flow of various illicit drugs and drug precursors from other countries, along with the counternarcotics initiatives within those countries.[80,81]

Unlike the U.S., heroin is the most-used illicit opioid in Europe.[82] Opium cultivation dropped 95% in 2023 following the opium ban in Afghanistan.[83] Although cultivation increased in 2024, it remained substantially lower than in 2022.[84] This ban will likely impact the availability of heroin in future years. However, in some European locations in recent years, prescription opioids and new synthetic opioids have overtaken heroin use, indicating a possible change in the continent's drug market. New synthetic opioids, including some nitazenes and fentanyl derivatives such as carfentanil, have already been detected in EU member states.[85]

7.2 SOCIODEMOGRAPHIC DIFFERENCES

The U.S. has observed a marked discrepancy in substance-related mortality trends by educational attainment, which relates to socioeconomic status. The U.S. has a relatively high level of inequality, as measured by the Gini coefficient.[86] This likely exacerbates the impact on SUD and related mortality compared to other countries. Income inequality, high stress, and insufficient investment in public policies can all contribute to a higher prevalence of drug use disorders within a country.[87] Also, on average, the cost of prescription drugs in the U.S. is about three times that of other countries,[88] which may drive people to purchase cheaper counterfeit drugs. Seeking treatment and healthcare – not just for substance use but for mental health in general – can be challenging for those in the U.S., with one in six reporting an inability to get or afford professional help during times of emotional distress.[89]

7.3 CULTURAL ATTITUDES

Stigmas and cultural attitudes toward substance use vary by geography, including inside the U.S. Alcohol is a legal and more socially acceptable substance in many countries, frequently used in more social settings. Alcohol consumption and heavy drinking vary by country, with countries in Europe seeing higher average consumption.[90] Individuals who use opioids have been found to be more socially isolated and stigmatized by society, which can impact treatment.[91] A few countries have decriminalized drug use and possession, which can reduce the stigma around drugs.[92]

Section 8 Canadian Drug Overdose Trends

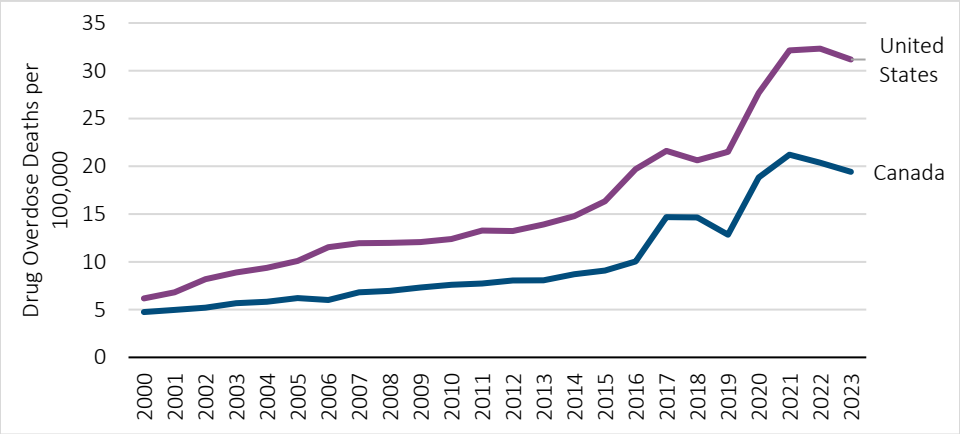
To further understand drug overdose trends, RGA performed an analysis on data from Statistics Canada, the nation's statistics office.

8.1 OVERALL TREND

Canadian drug overdose death rates have followed similar trends to the U.S., albeit at slightly lower levels. Both countries exhibited steady increases until 2017, with a slight slow-down before increasing again at the start of the COVID-19 pandemic. Like the U.S., Canada experienced a decrease in drug overdose rates in 2023, although these rates were still elevated compared to pre-pandemic levels (Figure 19).

Figure 19

DRUG OVERDOSE DEATH RATES IN THE CANADIAN AND U.S. GENERAL POPULATIONS, 2000-2023



Source: RGA analysis of mortality data from Statistics Canada and National Center for Health Statistics, National Vital Statistics System, and population data from Statistics Canada, the World Bank, and the U.S. Census Bureau.

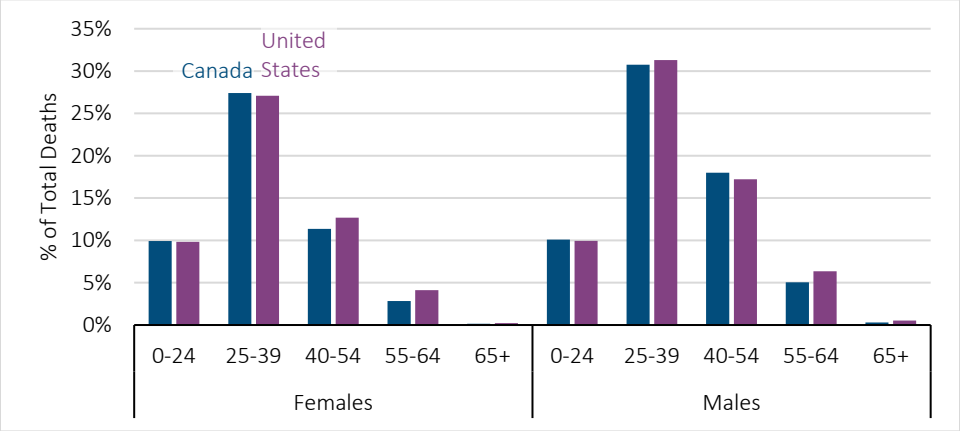
8.2 AGE AND SEX

Drug overdose deaths were analyzed as a portion of total deaths for age and sex in Canada and the U.S. to better understand demographic-specific trends. The two countries are quite similar in drug overdose death distributions, with ages 25-39 having disproportionately high numbers relative to total mortality for that age group in 2023. This holds true for both sexes (Figure 20).[f]

[f] An investigation was done to determine why the mortality rates between the U.S. and Canada differed significantly while the age distribution was so similar. Most of the difference was driven by the oldest age groups, where a wider gap between the U.S. and Canada was noticed. However, with the age comparison, the oldest age groups have the lowest portion of total deaths from drug overdoses due to having such high total mortality; thus, this difference is muted.

Figure 20

DRUG OVERDOSE DEATHS AS % OF TOTAL DEATHS BY SEX, AGE, AND COUNTRY, 2023



Source: RGA analysis of mortality data from Statistics Canada and National Center for Health Statistics, National Vital Statistics System.

8.3 OPIOIDS AND STIMULANTS

The Public Health Agency of Canada publishes key findings on opioid and stimulant toxicity deaths to further understand the differences by drug type. Some recent findings include:

- As in the U.S., deaths from apparent opioid toxicity are higher than deaths from stimulants.
- Between January 2016 and December 2024, there were 52,544 apparent opioid toxicity deaths; the majority of these were reported in British Columbia, Alberta, and Ontario.
- In 2024, apparent opioid toxicity deaths were 17% lower than the same period in 2023; apparent stimulant toxicity deaths were 22% lower.
- As in the U.S., a majority of the apparent opioid toxicity deaths in 2024 were among males (71%).
- In addition, like the U.S., most of the apparent opioid toxicity deaths involved fentanyl (74%).
- Seventy percent of all apparent opioid toxicity deaths in 2024 also involved a stimulant.[93]

Section 9 Outlook and Conclusion

> "*Over the past 15 years, mortality improvements have stagnated or reversed for many U.S. demographic subpopulations. In the same period, drug overdose deaths, particularly those involving synthetic opioids, have surged. U.S. drug overdose death rates decelerated in 2023; however, this trend was inconsistent across states, population groups, and drug type. Despite the promising decline, overdose remains the leading cause of death for Americans aged 18-44. More research is critical to identify the underlying drivers of this recent downturn. Not understanding what drove the reduction increases the risk that it will not be sustained.*" – Richard Russell, PhD, VP Biometric Research, RGA

The long U.S. history of increased substance-related mortality before the recent declines leads to a variety of questions about what comes next:

- Will the decrease continue indefinitely?
- Will a new wave emerge?
- Will drug supply subside?
- What about demand?
- Will access to care improve or decline?

While this report does not provide a direct projection of future deaths, it does offer insight into drivers and considerations of substance use mortality – drawing upon lessons from the waves of different drug types, drug contamination, polysubstance use, COVID-19, recent advancements in treatment availability, and regulations and drug supply in the U.S. relative to other countries.

The overdose epidemic was originally fueled by various factors such as intensive marketing and pain-relief campaigns, which led to an increase in prescription opioid use. Over time, the overdose crisis rippled with waves of heroin, fentanyl, and polysubstance use – often escalating at each step to more potent substances. Drug contamination and the introduction of more potent, novel substances is an ever-evolving and fluid situation with high potential to impact drug overdose mortality trends in the future.

Mental health comorbidity is another concern. Hopelessness, isolation, and a history of trauma can lead to SUDs. The COVID-19 pandemic exacerbated feelings of isolation, producing rapid spikes of substance-related mortality in 2020 and 2021. Unfortunately, mental health risk factors behind addiction do not show signs of improving, with studies indicating declining mental health and increasing long-term stress in the U.S., particularly among young and middle-aged adults.[94,95]

Despite these challenges, substance-related mortality trends have improved over the past two years. Researchers continue to investigate drivers of this positive shift. Overdose reversal medications like naloxone, medication-assisted treatment, and drug checking equipment have all been made more available. Increased awareness of fentanyl's dangers also may be contributing to recent declines, with the possibility that many of the most susceptible to misuse have either died, sought treatment, or moved to less-potent strains.

Even if substance misuse subsides, collateral damage remains. Beyond the acute drug overdose deaths examined in this report, the cumulative impact of chronic drug use is of concern. SUD can be linked to a variety of adverse long-term health effects,[96] and alcohol's most widespread impacts are from chronic conditions, which take time to manifest.[97] Thus, it is possible we will continue to see heightened impacts on various diseases, such as cardiovascular and liver disorders, and alcohol-attributable cancers, such as colon, liver, oral, and breast cancers, in the coming years.

Trends and drivers are not universally applicable. Analyses of the general population and insured lives reveal that substance-related mortality trends and substance use disorders vary by demographic. Certain demographics – such

as males, individuals with lower education levels, and smokers – exhibited higher substance-related mortality rates. On a global level, the U.S. has the highest rates of deaths attributed to drug use, potentially due to factors surrounding regulations, treatment availability, drug supply chain, and cultural and sociodemographic differences.

What does this mean for insurers?

The implications affect many areas of insurance. In underwriting, for example, fluid testing, questionnaires, and physician statements can provide evidence of substance use. The shift to accelerated underwriting may create gaps and heightened risk, but the use of electronic health records may mitigate this. Identifying red flags and interpreting subtle indicators may help underwriters recognize applicants who could be at higher risk of substance use disorder. This includes recognizing combinations of risk factors that may not explicitly indicate substance use, such as a history of accidents or falls, anxiety and depression, or extended periods of leave.

For trend analysis and assumption setting, this report highlights the importance of considering differences in cause of death trends between the general population and insured lives. The impact of substance-related deaths on mortality deterioration was larger for the general population compared to insured lives. However, there are important considerations to highlight, including different cause of death definitions and different demographic mixes between the general and insured population datasets.

Hope for a growing wave of positive outcomes lies in the emerging data: A decline in substance-related mortality is evident for both the U.S. general population and the insured population. These declines could be due to the availability of treatment, heightened awareness, or even acceleration of deaths in high-risk users. It may be too soon to expect these declines to continue, as it is apparent that many offsetting and ever-evolving factors could be at play. While the most recent data is encouraging, continued attention to substance-related mortality trends and their underlying drivers may provide valuable insights into both immediate and long-term implications.

Section 10 Acknowledgments

The researchers' deepest gratitude goes to those without whose efforts this project could not have come to fruition: the Project Oversight Group for their diligent work overseeing, reviewing and editing this report for accuracy and relevance.

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Appendix A: Substance Use Disorder Classifications

Substance use disorder (SUD) is a condition defined by the uncontrolled use of a substance despite harmful consequences. Substances can include alcohol, tobacco, or other psychoactive substances. Throughout the report, two substance-specific disorders were discussed:

- *Opioid use disorder* (OUD) is a pattern of opioid use that leads to problems or distress, with at least two qualifying criteria occurring within 12 months.
- *Alcohol use disorder* (AUD) is a pattern of alcohol use that leads to problems or distress, with at least two qualifying criteria occurring within 12 months.

Refer to DSM-5 for further criteria in how SUD, OUD, and AUD are classified. Criteria also determine sub-classifications: mild, moderate, and severe.

Appendix B: General Population Data Analysis

B.1 ICD-10 CODES FOR DRUG OVERDOSE DEATHS

Drug overdose deaths in the general population analyses were defined by underlying cause of death ICD-10 codes X40-X44, X60-64, X85, and Y10-Y14. Specific drug types in the analyses were defined by multiple cause of death ICD-10 codes as follows: Opioids (T40.0 – T40.4, T40.6), Heroin (T40.1), Prescription Opioids (T40.2, T40.3), Fentanyl and Synthetic Opioids (T40.4), Stimulants (T40.5, T43.6), Cocaine (T40.5), and Psychostimulants with Abuse Potential (T43.6).

B.2 ICD-10 CODES FOR ALCOHOL-INDUCED DEATHS

Alcohol-induced deaths in the general population analyses were defined by underlying cause of death ICD-10 codes E24.4 (Alcohol-induced pseudo-Cushing's syndrome), F10 (Mental and behavioral disorders due to use of alcohol), G31.2 (Degeneration of nervous system due to alcohol), G62.1 (Alcoholic polyneuropathy), G72.1 (Alcohol myopathy), I42.6 (Alcoholic cardiomyopathy), K29.2 (Alcoholic gastritis), K70 (Alcoholic liver disease), K85.2 (Alcohol-induced acute pancreatitis), K86.0 (Alcoholic-induced chronic pancreatitis), R78.0 (Excess alcohol blood levels), X45 (Accidental poisoning by and exposure to alcohol), X65 (Intentional self-poisoning by and exposure to alcohol), and Y15 (Poisoning by and exposure to alcohol, undetermined intent).

B.3 ALCOHOL-INDUCED DEATHS VS. ALCOHOL-RELATED DEATHS

Alcohol-induced deaths encompass deaths where the underlying cause of death is 100% attributable to alcohol. *Alcohol-related* deaths are a broader category which includes both alcohol-induced deaths and causes of death that are partially attributable to alcohol, such as motor vehicle accidents. Other studies may use different definitions for *alcohol-specific*, *alcohol-induced*, *alcohol-attributable*, and *alcohol-related* deaths.

B.4 DATA LIMITATIONS

There may be data limitations related to the accurate and timely reporting of substance use disorder and substance-related mortality and the relevant demographics. Within the data analyses, there are also likely correlations between certain demographic groups, e.g., education and occupation.

Appendix C: Insured Analysis

Claims were flagged with a combined cause of death code denoted 'Alcoholism/Drug Overdose.' Most clients provide a code that indicates an alcohol- or drug-related cause of death or a death certificate indicating the cause of death. The following guidance is used to categorize alcohol- and drug-related deaths:

Description	Key Words	Notes
Alcoholism/Drug Overdose	Illicit (non-prescription) drug and alcohol intoxication or overdose – unless manner is suicide ETOH (Ethanol – alcohol intoxication) Alcohol-related Cirrhosis	Accidental deaths due to being drunk (i.e., drowning or falls, not MVA). If just Cirrhosis is listed, with no mention of Alcohol or Ethanol intoxication, code as *Liver Failure* (not *Alcoholism/Drug Overdose*).

It is important to note that the causes of death are defined and flagged differently in the insured and general population datasets, as described in the above sections. Thus, direct comparisons between these datasets can be difficult.

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