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Prevalence of prescription and illicit drugs in suicides of non-poisoning means in the National Violent Death Reporting System 2003–2017

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Abstract

Background: Prescription and illicit drugs are important social environmental variables in many suicides regardless of their role as an immediate cause of death.

Objectives: To investigate the presence of prescription and illicit drugs, either through mention in the death record or toxicology reports, among suicides attributed to non-poisonous causes to identify patterns of risk.

Methods: Using the 2003–2017 National Violent Death Reporting System (NVDRS), we examined the presence of prescription and illicit drugs among 143,175 suicides (119,563 males 23,612 females) due to firearms and suffocation/hanging. Presence of drugs (opioids, stimulants, benzodiazepines, muscle relaxants, and cannabis) was determined from toxicology reports and text searches of coroner/medical examiner and law enforcement summaries. We fit multivariable logistic regression models to estimate associations between drug class and suicide method adjusting for decedent characteristics.

Results: Overall prescription and illicit drugs were present in 22% of firearm deaths and 28% of suffocation deaths. Among victims with toxicology reports, over 20% tested positive for benzodiazepines. Benzodiazepines were mentioned in 4% of firearm and 5% of suffocation suicides without toxicology testing. Stimulants were more likely to occur in suffocation than

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firearm deaths among victims with toxicology testing (aOR = 1.44, 95% CI: 1.33–1.56) and without toxicology testing (aOR = 1.61, 95% CI: 1.31–1.98).

Conclusions: Benzodiazepines were most frequently identified in both toxicology reports and narratives of suicides by firearms or suffocation. Better distinction of the presence of prescription and illicit drugs in the environment versus apparent ingestion among non-poisoning suicides are needed to inform prevention approaches.

Keywords

Suicide; pharmaceuticals; opioids; stimulants; firearm; mortality

Introduction

Suicide is the 10th leading cause of death in the United States, with more than 48,000 suicides in 2018 alone [1]. For individuals between the ages of 10 and 34, suicide is the second leading cause of death and accounts for significant premature loss of life [1]. Further, suicides are expected to increase in the coming years, given recent estimates that during the coronavirus (COVID-19) pandemic, approximately 1 in 10 US adults (and 1 in 4 young adults) report having seriously considered suicide within the past 30 days [2]. Risk factors for suicide include age, gender, and geographic location (rural vs. urban) among other prominent factors [3]. In addition, the method of suicide varies across these factors [4] with there being increasing prevalence of the two most common methods of suicide—firearms and suffocation (e.g., hanging, strangulation)—in recent years. Both methods now account for 79% of suicides, whereas poisoning-related suicides have remained stable or decreased slightly and now account for only 13% of suicides [1]. These trends underscore the need to illuminate factors that influence the method of suicide so as to better inform targeted interventions to prevent these deaths.

Substance use is a well-documented risk factor for suicide, suicide attempt, and suicidal self-directed violence [5–9]. On the one hand, the link between substance use and poisoning-related suicide may reflect a tautology when substance use (e.g., poisoning, overdose) is the method of suicide. However, substance use is also a social environmental variable that may shape risk for suicide, as well as differential choice of methods other than poisoning. This may occur either through its direct effects on impairment of cognitive decision-making [10] or its co-association with other suicide risk factors such as depression and chronic pain [11]. In addition, prescription and illicit drugs in the contextual or physical environment, even if not ingested, are an important part of structuring the fatality of a suicide attempt. For example, persons with opioid dependence, as compared to those with alcohol dependence, have higher rates of gun involvement [12], and gun ownership is itself associated with markedly higher risk of suicide by firearms (but not other methods) in both men and women [13]. In this regard, drug class, as well as drug presence may shape the likelihood that a suicide victim dies by firearm, suffocation, or other non-poisoning methods.

Although much work has examined the role of alcohol in violent deaths [14–16], the ways in which prescription and illicit drugs act as an environmental variable to influence the method of suicide has received relatively little attention [7,17,18]. In one study using Colorado

mortality records and post-mortem toxicology reports, substance use was identified as a proximal factor in both firearm- and suffocation-related suicides [18]. Opioid use was also more common in firearm than suffocation-related suicides, whereas antidepressants were less common in firearm deaths. However, the ascertainment of substance use was based on toxicology only, which may potentially underestimate the role of prescription and illicit drugs in non-poisoning suicide methods.

The current study investigates associations between prescription and illicit drugs in the decedent's environment, measured holistically via both toxicology reports and summaries of law enforcement and coroner/medical examiner investigations, and method of suicide among individuals deceased from firearm and suffocation-related means of death. To do so, we draw on information available in the 2003–2017 National Violent Death Reporting System (NVDRS) [19]. Our aim is to identify possible points of intervention that may reduce the risk of suicide by the two most common non-poisoning methods.

Methods

Data Source

We use data from Centers of Disease Control and Prevention NVDRS, a state-based surveillance system that compiles information from death certificates, toxicology reports, coroner and medical examiner reports, and law enforcement reports on violent deaths [19]. Because states began contributing to the database in different years, not all states are represented across the lifespan (2003–2017) of the current database. To create the NVDRS, trained state-based Public Health workers (PHW), following the NVDRS coding manual, extensively classify features of the violent deaths. Deaths attributable to suicide (N = 199,741) were identified by the preponderance of evidence in the record, including whether the death certificate recorded suicide as an underlying cause of death (ICD X60-X84, Y87.0) or absent that the death circumstances supported a suicide classification. PHW also classified the method of suicide into 1 of several categories, including poisoning, firearms, suffocation (including hanging), and other causes. For the current study, we restricted the sample to suicides where the method of death was classified as due to firearms or suffocation (N = 149,678). Finally, the NVDRS death record typically includes 2 brief narratives written by the PHW each summarizing coroner/medical examiner and law enforcement reports of the incident. For the final study sample, we excluded victims younger than 10 years of age (N = 26); who had narrative summaries that were 20 words or shorter (N = 6,459); and/or were missing information on sex (N = 37). This resulted in a final study sample of N = 143,175 firearm- or suffocation-related suicide deaths occurring between January 1, 2003 and December 31, 2017. This study was reviewed by the UCLA Institutional Review Board and deemed exempt.

Study measures

Drug presence—In the current study we focus on illicit and prescription drugs with high risk of misuse. To assess their presence, we used two approaches. First, approximately 43% of eligible deaths included any evidence of a toxicology report—the actual prevalence varies by drug class. From these reports, we coded deaths for presence of opioids, benzodiazepines,

muscle relaxants, amphetamines, and cannabis. Second, we conducted text searches of the death narratives to identify mention of drugs in the environment in coroner/medical examiner and law enforcement summaries. To do so we first developed a comprehensive list of search terms for the same 5 drug classes. Using this list, we identified cases where these drugs were mentioned in the narratives and coded the deaths for presence or absence of the terms in the narratives. As some narratives listed results of toxicology reports, these two measures of drugs in the environment can overlap; hence for some analyzes we split the sample into mutually exclusive subsamples (toxicology report present, yes/no).

Decedent characteristics—The NVDRS provides information on both decedent demographics and key covariates likely associated with method of suicide. These include age, binary sex (male/female), race/ethnicity (coded as non-Hispanic White, non-Hispanic Black, Hispanic, and Other), education (coded as less than high school/ high school, GED, or greater), marital status (coded as married, single, widowed, divorced/separated), U.S. Census region (Northeast, South, West, Midwest), and incident year. In addition, PHW using information in the death file coded deaths for presence or absence of physical health problems (e.g., victim was experiencing problems such as chronic pain or terminal disease, yes/no), mental health problems (e.g., victim was identified as having a mental health problem excepting alcohol and other substance dependence at the time of injury, yes/no), substance abuse (e.g., victim was perceived by self or others to have a problem with drugs other than alcohol at the time of the injury, yes/no), and depressed mood (e.g., victim was perceived by self or others to be depressed at the time of the injury, yes/no).

Statistical analysis

We first estimated demographic and mental health/substance abuse differences across method of suicide and in toxicology testing using multivariable logistic regression. Next, we compared patterns of drug mention and toxicology results across suicide methods. Multivariable logistic regression models were fit to estimate odds ratios and 95% CI, adjusting for demographic characteristics, physical and mental health problems, substance abuse, depressed mood, and incident year. We used multiple imputation with chained equations to multiple impute (k=20) missing values for covariates conditional on all other covariates and the outcome. Within each of the 20 complete datasets, we ran multivariable models and used Rubin’s rules to combine estimates. All analyses were conducted in SAS version 9.4 (Cary, NC).

Results

Demographic and health status characteristics of deaths by means of death

Between 2003–2017, there were 93,011 suicides by firearms and 50,164 by suffocation-related methods among individuals ages 10 years and older that met our study inclusion criteria. Victims of suffocation-related suicides were younger, more likely to be female and racial/ethnic minority, and less likely to reside in in the Northeast (Table 1). Compared to victims of firearm-involved suicides, suffocation-related suicide victims were also less likely to be perceived to have physical health problems but were more likely to have mental health and substance use problems and depressed mood.

Characteristics associated with toxicology testing

Toxicology testing for opioids, amphetamines, cannabis, benzodiazepines, and muscle relaxants occurred in 60%, 57%, 48%, 30%, 17% of cases, respectively. 53,694 cases (37.5%) had toxicology testing for multiple substances. Compared to non-Hispanic White victims, non-Hispanic Black victims were more likely to be tested for opioids, benzodiazepines, and amphetamines, whereas Hispanic victims were less likely to be tested for benzodiazepines and muscle relaxants (Table 2). Victims of Other race were less likely than non-Hispanic Whites to have testing across all drug classes. Suicides occurring in the South were less likely to include toxicology testing for all drugs compared to all other regions. Victims who were perceived to have a substance use problem at the time of the death investigation were more likely to have toxicology testing ordered. Compared to suicides involving firearms, suffocation-related suicides were more likely to have toxicology testing across all drug classes (e.g., testing for opioids aOR = 1.43, 95% CI: 1.38–1.48).

Prescription and illicit drugs in the environment by means of death

Overall, the presence of prescription and illicit drugs either by mention in the narrative or toxicology reports occurred in 22% of firearm deaths and 28% of suffocation deaths. In particular, opioids were present in 10% of suicides, regardless of means. Among cases where toxicology testing occurred, opioids, benzodiazepines, and cannabis were lower in suffocation-related suicides than firearm suicides (Table 3). For example, among suffocation-related suicide cases in which toxicology testing for benzodiazepines occurred, 22% tested positive for benzodiazepines, in contrast to 25% of firearm-suicide cases (aOR = 0.72, 95% CI: 0.67–0.77). However, suffocation-related suicides were more likely to test positive for stimulants (aOR = 1.44, 95% CI: 1.33–1.56). Of the 53,694 suicides with toxicology testing for multiple substances, 9% tested positive for multiple substances. There was no difference in prevalence of multiple substances by lethal method.

Among cases where toxicology testing did not occur, opioids, benzodiazepines, muscle relaxants, and stimulants were nevertheless mentioned in 3.5%, 4.1%, 0.8%, and 0.9% of non-poisoning suicides narratives (Table 3). Opioids and cannabis were less likely to be mentioned in narratives of suffocation-related suicides compared to firearm-related suicides (opioids aOR = 0.82, 95% CI: 0.72–0.94; cannabis aOR = 0.70, 95% CI: 0.63–0.79), whereas stimulants were more common in suffocation-related suicides (aOR = 1.61, 95% CI: 1.31–1.98). The presence of benzodiazepines and muscle relaxants was not associated with the method of suicide (benzodiazepines aOR= 0.98, 95% CI: 0.81–1.19; muscle relaxants: aOR = 0.99, 95% CI: 0.72–1.38).

Discussion

The context and personal environment of suicides represent potentially critical opportunities to prevent what is often viewed as an impulsive action. Results of our study indicate that it is relatively common to find prescription and illicit drugs, including opioids, directly or indirectly involved in suicides that result from firearm use or suffocation. In the current study, we found that approximately 24% of these deaths were accompanied by either the mention of drugs in the administrative narratives and/or post-mortem toxicological testing

evidence. In particular, we observed that opioids and cannabis are more likely to be involved in firearm deaths, whereas stimulants are more likely to be associated with suffocation-related suicides. While our findings are generally consistent with a previous study using autopsy and toxicology data on suicide decedents in Colorado between 2004–2009 [18], our study provides additional evidence on the relationship between types of drugs in the environment and means of death. In the earlier study, victims who tested positive for opioids were less likely to use suffocation methods than firearms. However, the study did not find associations between amphetamines and cannabis and suicide method. With a much larger sample, we were able to detect these associations. In addition, these differing findings could also be due to heterogeneity in drug use patterns across time (i.e., 2004–2009 versus 2003–2017), space (i.e., Colorado versus other states captured in the NVDRS), and populations under study (i.e., excluding versus including decedents younger than 18 years).

Demographic and health information on decedents offers clues for understanding factors that may have precipitated these deaths [20–22]. In our study, firearm-related suicide decedents were likely to be older and have physical health problems such cancer or terminal illness, which are conditions for which prescription opioids are indicated [23]. In contrast, victims of suffocation-related suicides were typically younger and more likely to have mental health problems mentioned during the investigation of their deaths. Although we did not assess the specific mental health problem beyond depression, some mental health problems such as anxiety can result in prescriptions for benzodiazepines. Our results underscore that prescription drugs in the context of suicides reflect a reality of both medical and non-medical use patterns. It will be particularly useful to study prescription drugs in the context of suicides especially when those drugs are prescribed for medical reasons in order to determine whether suicides can be prevented through different approaches to prescribing patterns, frequency of patient visits as a part of the evaluation of potential suicidal ideation, or to check on the need for supportive therapies.

Extant models of suicide risk often underscore the relationship between impulsivity and suicide attempt [24]. The impulsivity-related trait of poor premeditation in particular may differentiate those who contemplate versus attempt suicide [25]. People with a propensity for impulsive behaviors may be more vulnerable to engage in suicidal self-directed violent behaviors particularly when triggered by the effects of alcohol [26]. Similarly, use of illicit and prescription drugs with potential for misuse may be a cause of impulsive behaviors through processes involving behavioral disinhibition and poor decision-making [27]. However, given that drug use may also be a consequence of an underlying impulsivity trait, complex interactions between different types of illicit and prescription drugs, psychiatric comorbidities, and impulsivity warrant further investigation to refine models of risk and inform prevention strategies that are targeted to address suicide, suicide attempt, and suicidal self-directed violence.

Suicide prevention programs often focus on creating more supportive environments both emotionally and economically for at-risk individual paired with curbing access to lethal means such as firearms. Indeed, much effort has been expended to achieving safer firearm storage in the home to reduce firearm-related deaths [28]. Our findings suggest another arrow for the prevention quiver: tailoring inventions for safe storage of prescription drugs

with high risk of misuse. If our findings are replicated, curbing access to stimulants for individuals with higher suicide-related behavior profiles may also be one potential suicide prevention strategy. Restricting the days supply that can be dispensed or using blister packs may be low-tech prevention strategies [29]. Yet, in this era of technology-based pill counts, smart pill containers, smart or digital pills and apps designed to monitor everything from number of pills extracted to time the drug is taken, those persons with risk of suicide or misuse of illicit drugs may be prime candidates for data collection and interventions that track, monitor and notify others or potential drug-related suicide behaviors [30]. Alerts within a support system or within the health care system for potential drug misuse may also serve as potential candidates for suicide prevention programs.

Our findings should be contextualized keeping four limitations in mind. First, the NVDRS, while including an increasingly comprehensive compilation of suicide deaths in the United States is a relatively new administrative database with several known weaknesses [31]. For example, it did not include all 50 states until 2018, hence the findings, particularly in the earlier years, reflect the experience of many smaller, and more rural states. Second, for the current study, we, by necessity, relied on proxy-derived information that reflects summaries of death records created by state-based public health workers. Although these individuals were trained by CDC and followed a detailed codebook, the records they were working with varied substantially in completeness and depth of investigation. This fact is reflected in our observation that only 43% of suicides included any evidence of post-mortem toxicology testing (however, blood alcohol was tested in 82% of suicides). Our multiple imputation strategy is expected to address potential information bias due to missing data under the assumption that missingness is random conditional on measured covariates in our imputation model. However, in hypothetical scenarios where we assume that associations between lethal means and toxicology reports differ substantially between cases with versus without toxicology report data, our results may be biased in either direction. Similarly mentions of co-occurring health problems and substance use may reflect factors that are somehow linked to the means of death, leading to potential bias in our estimations. Third, we focus here on the two most common methods of suicide, firearms and suffocation, excluding poisoning-related deaths. Thus, our estimates of drug use patterns are limited to this subset of suicides. Lastly, because the NVDRS subset of suicides comprises only cases, it precludes estimation of risk and identification of risk factors for suicide. However, the NVDRS represents a rich source of information about the proximal factors associated with lethal means of suicide. Other datasets with a non-decedent comparator group, such as those who have contemplated or attempted suicide or general population controls (e.g., United States Multi-Level Suicide Data Set [32]), can offer additional insights to inform suicide prevention initiatives. Nevertheless, with its current coverage of all 50 states, NVDRS will likely be an increasingly important resource for public health research, including research related to drug use and its relevance to violent death.

In conclusion, prescription and illicit drugs may be an important part of the social and environmental context of suicide deaths, influencing not only the lethal means of death but also, potentially, the probability of death. Given the challenges of developing interventions to reduce suicides, especially suffocation-related suicides, further understanding of drugs

as an environmental risk factor for non-poisoning suicides may inform potential prevention approaches.

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Table 1.

Demographic and circumstantial characteristics of suicides by firearm and suffocation methods in the NVDRS, 2003–2017

	Firearm (N = 93,011)		Suffocation (N = 50,164)	
	n	**Est.**	**n**	**Est.**
Age, median (IQR)	**93,011**	49 (33–63)	**50,164**	38 (26–51)
Male, %	80,201	86	39,362	78
Race/ethnicity, %				
Non-Hispanic White	81,239	87	38,601	77
Non-Hispanic Black	5,486	6	3,320	7
Hispanic	3,291	4	4,415	9
Non-Hispanic other	2,994	3	3,827	8
Education, %				
Less than high school	18,636	20	12,240	24
High school or more	74,375	80	37,925	76
Marital status, %				
Never married	36,303	39	14,222	28
Married [a]	28,411	31	23,808	47
Widowed	6,529	7	1,486	3
Divorced/separated	21,768	23	10,649	21
Region, %				
South	16,778	18	10,001	20
Midwest	8,312	9	12,047	24
Northeast	45,109	48	16,859	34
West	22,812	25	11,257	22
Physical health problems, %	23,521	25	5,522	11
Mental health problems, %	34,259	37	23,280	46
Substance abuse, %	9,591	10	9,705	19
Depressed mood, %	30,996	33	19,168	38

Note. N = 143,175. Est = estimate.

[a] Includes civil unions and domestic partnerships.

Table 2.

Association between decedent and circumstantial characteristics and whether toxicology testing occurred by drug type among suicides due to firearms or suffocation, 2003–2017 NVDRS

	Opioids		Benzodiazepines		Muscle relaxants		Amphetamines		Cannabis	
Characteristic	**aOR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**
Age (years)	0.99	(0.99, 0.99)	0.99	(0.99, 0.99)	0.99	(0.99, 0.99)	0.99	(0.99, 0.99)	0.99	(0.99, 0.99)
Female sex	1.08	(1.04, 1.11)	1.06	(1.02, 1.09)	1.04	(1.01, 1.08)	1.06	(1.03, 1.10)	1.07	(1.04, 1.11)
Race/ethnicity										
Non-Hispanic White	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Non-Hispanic Black	1.14	(1.08, 1.21)	1.10	(1.05, 1.16)	0.98	(0.92, 1.03)	1.13	(1.08, 1.20)	1.02	(0.97, 1.08)
Hispanic	1.18	(1.10, 1.26)	0.77	(0.73, 0.82)	0.72	(0.68, 0.76)	1.03	(0.97, 1.09)	0.99	(0.94, 1.05)
Other	0.87	(0.81, 0.93)	0.87	(0.82, 0.92)	0.59	(0.55, 0.63)	0.90	(0.85, 0.95)	0.71	(0.67, 0.75)
Education										
Less than high school	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
High school or more	1.04	(1.01, 1.08)	1.06	(1.02, 1.09)	0.97	(0.94, 1.00)	1.09	(1.06, 1.12)	0.98	(0.95, 1.01)
Marital status										
Never married	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Married [a]	1.05	(1.01, 1.09)	1.08	(1.04, 1.12)	1.13	(1.09, 1.17)	1.06	(1.02, 1.09)	1.12	(1.08, 1.16)
Widowed	1.03	(0.95, 1.12)	1.07	(0.99, 1.16)	1.09	(1.00, 1.18)	1.03	(0.95, 1.11)	1.07	(0.99, 1.16)
Divorced/separated	1.01	(0.97, 1.05)	1.04	(1.00, 1.07)	1.07	(1.03, 1.11)	1.01	(0.98, 1.05)	1.08	(1.04, 1.12)
Region										
South	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Midwest	3.34	(3.21, 3.47)	2.92	(2.82, 3.03)	3.29	(3.16, 3.41)	2.67	(2.58, 2.77)	4.49	(4.33, 4.65)
Northeast	6.28	(5.99, 6.59)	5.36	(5.16, 5.58)	6.33	(6.06, 6.60)	4.51	(4.34, 4.69)	7.69	(7.38, 8.00)
West	3.17	(3.06, 3.28)	2.28	(2.21, 2.36)	2.44	(2.36, 2.52)	2.40	(2.33, 2.48)	3.48	(3.37, 3.58)
Lethal method										
Firearm	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Hanging	1.43	(1.38, 1.48)	1.30	(1.27, 1.34)	1.22	(1.18, 1.25)	1.27	(1.24, 1.31)	1.19	(1.16, 1.23)
Physical health problems	1.11	(1.07, 1.16)	1.10	(1.07, 1.14)	1.12	(1.08, 1.17)	1.11	(1.07, 1.15)	1.09	(1.05, 1.13)
Mental health problems	0.97	(0.94, 0.99)	0.94	(0.92, 0.96)	0.93	(0.90, 0.95)	0.93	(0.91, 0.95)	0.87	(0.85, 0.90)

	Opioids		Benzodiazepines		Muscle relaxants		Amphetamines		Cannabis	
Characteristic	**aOR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**
Substance abuse	1.42	(1.37, 1.48)	1.27	(1.23, 1.31)	1.17	(1.13, 1.21)	1.27	(1.23, 1.31)	1.15	(1.11, 1.19)
Depressed mood	0.96	(0.93, 0.99)	0.93	(0.91, 0.95)	0.94	(0.92, 0.97)	0.97	(0.95, 1.00)	0.99	(0.96, 1.02)
Incident year	1.06	(1.06, 1.07)	1.03	(1.03, 1.03)	0.99	(0.98, 0.99)	1.06	(1.05, 1.06)	1.05	(1.05, 1.05)

Note. N = 143,175. aOR = adjusted odds ratio; CI = confidence interval, Ref = referent. For binary variables, value not shown is referent.

[a]Includes civil unions and domestic partnerships.

Table 3.

Prevalence of drugs in suicides by lethal method in the NVDRS, 2003–2017

	Firearm-related			Suffocation-related				
	N	Drug present[a]	%	N	Drug present[a]	%	Adjusted odds ratio[b]	95% confidence interval
Toxicology ordered								
Opioid	32,524	5,386	17	23,232	2,910	13	0.68	(0.64–0.72)
Benzodiazepines	15,781	3,886	25	11,717	2,579	22	0.72	(0.67–0.77)
Muscle relaxants	8,712	296	3	7,155	191	3	0.89	(0.72–1.10)
Stimulants	31,149	1,716	6	22,092	2,021	9	1.44	(1.33–1.56)
Cannabis	25,604	4,343	17	19,073	3,591	19	0.89	(0.84–0.95)
Toxicology not ordered								
Opioid	30,772	1,131	4	11,549	355	3	0.81	(0.69–0.95)
Benzodiazepines	9,042	336	4	4,568	220	5	1.01	(0.83–1.24)
Muscle relaxants	14,334	111	1	7,863	66	1	1.07	(0.76–1.49)
Stimulants	31,226	197	1	12,345	215	2	1.65	(1.29–2.10)
Cannabis	37,304	1,028	3	15,736	546	3	0.72	(0.63–0.82)

Note. N = 143,175.

[a] In victims with no toxicology, presence ascertained using narrative search terms. In victims with toxicology, presence ascertained by positive test result.

[b] Adjusted for age, sex, race/ethnicity, Census region, education, marital status, physical health problems, mental health problems, substance abuse, depressed mood, and incident year.