Mental health treatment seeking and history of suicidal thoughts among suicide decedents by mechanism, 2003-2018

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Word Count: 2,698

Key Points

Question: Does mental health/substance use treatment utilization and suicidal thoughts/plans differ among those who died by suicide via firearm compared to other methods?

Findings: Results from a cross sectional study of 234,652 participants indicated those who used a firearm were less likely to engage in treatment, more likely to disclose thoughts/plans, and less likely to have previously attempted.

Meaning: Those who die by suicide via firearm are less likely to seek treatment, more likely to die on their first attempt, and more likely to tell someone about their suicidal thoughts/plans. This emphasizes the importance of community-based interventions for suicide prevention.

Abstract

Importance: Understanding mental health/substance use treatment seeking and suicidality among suicide decedents is important to determine prevention efforts.

Objective: Determine differences in treatment seeking and suicidality among those who use firearms and other methods in their suicide death.

Design: Cross-sectional data were collected from 2003-2018.

Setting: Participant information was reported by their state of residence to the National Violent Death Reporting System (NVDRS).

Participants: Participants were 234,652 suicide decedents.

Main outcomes: Treatment for mental health/substance use at time of death, previous treatment for mental health/substance use, history of suicidal ideation/plans, history of suicide attempts, and disclosure of suicidal ideation/plans.

Results: A majority of decedents were White (87.8%) and male (77.8%). Ages ranged from 3 to 112 (M = 46.27; SD = 18.18). Compared to those who died by another method (n = 117,526; 50.1%), those who died by firearm (n = 117,126; 49.9%) were more likely to have disclosed thoughts/plans of suicide within the month prior to death (OR = 1.157 [CI 1.133, 1.182]. Compared to those who died by suicide by poisoning, those who used a firearm were more likely to have a history of suicidal thoughts/plans (OR = 1.188 [CI 1.149, 1.230]), and to have disclosed their thoughts/plans of suicide within the month prior to death (1.054 [1.031, 1.097]). Compared to those who died by suicide by hanging, those who used a firearm were more likely to have disclosed their thoughts/plans of suicide to another person within the month prior to their death (1.142 [1.114, 1.171])

Conclusion and relevance: Findings provide information for who is at risk to die by firearm suicide. Community-based interventions in suicide prevention can help reduce one's access to firearms during a time of crisis. The finding that firearm suicide decedents were more likely to disclose their thoughts/plans provides an important avenue for prevention.

Introduction

In the United States (US), suicide rates have risen 33% over the last 18 years[1] and research suggests that our understanding of risk factors for suicide is limited.[2] The need for alternate approaches to suicide prevention is clear. Means safety, or means restriction, is defined as rendering suicide methods less lethal or available, is one potentially effective possibility.

Means safety has been found to reduce rates of suicide. For example, the Israeli Defense Force saw a 40% reduction in young service members suicide rates when they instituted a policy that didn't let them take their firearms on leave (Lubin et al., 2010). In the US, one way to increase the effectiveness of means safety is to determine who utilizes firearms in their suicide death. Although limited, research has found that firearm suicide decedents were more likely to be men, store their firearms unloaded, and own a handgun compared those who used another method[3-6]; and were more likely to own a firearm and were younger than those who died by hanging.[7] Research has found that men who used a firearm were more likely to be married and die at home than women, and unmarried men were more likely to die by hanging than married men.[8] Decedents who died using a firearm have also been shown to be less likely than those who died by other methods to have had a previous suicide attempt (SA).[9] Although these findings are informative, little is known about other factors (e.g., mental health or substance use treatment seeking behavior) associated with means selection.

A majority of the research on help-seeking behavior for suicide has been conducted among individuals who survived an attempt,[10] making it difficult to generalize to those who have died by suicide; and the research that does exist has not examined how help-seeking habits differ between those who utilize specific methods.[11] Additionally, limited research has examined what factors impact the choice to disclose thoughts of suicide. To the best of our knowledge, no study

has examined if individuals who die by suicide using specific methods are more or less likely to disclose suicidal thoughts prior to their death.

Those who die by firearm are thought to represent a unique subset of decedents who differ from others on a number of variables. Research has shown that those who identify with gun culture often also identify with traditional masculine norms,[15] which may negatively impact help-seeking. Specifically, masculinity has been associated with delays in help-seeking, including for depression.[16,17] Potentially decreased rates of help-seeking among those who own firearms may result in firearm decedents seeking mental health care at lower rates than decedents who died by another method. Given that those who die by a firearm likely come in contact with mental health care less frequently, it is likely that their records would show lower rates of ideation and disclosure of ideation compared to those who died by other means.

Previous studies utilized the National Violent Death Reporting System (NVDRS) to examine treatment prior to a death by suicide. A study by Niederkrotenthaler and colleagues (2014) found that 28.5% of individuals sought treatment before their death; and that those who died by poisoning, had a history of SA, and had non-alcoholic substance use/dependence were more likely to be in treatment. Additional research is needed to determine how treatment seeking differs among those who use methods other than poisoning and how other factors relate to method selection. Another study examined the differences between male and female firearm suicide decedents and found multiple factors are (e.g., diagnosis of mental health problems) associated with odds of using a firearm in a suicide death (Kaplan, McFarland, & Huguet, 2009). Prior work hasn't determined differences between those who used a firearm and those who used other methods (i.e., hanging and poisoning).

Although previous research has sought to understand method selection, these studies were largely limited by their methodology and sample sizes. Specifically, many studies feature small sample sizes (e.g., 97 suicide decedents)[18] or were restricted to specific geographical locations (e.g., Colorado).[19] Additionally, most data is collected from family and friends of decedents, with data collection sometimes occurring years after the death.[20] The NVDRS is a national dataset maintained by the CDC that addresses many of these concerns. The data are compiled from death certificates, medical examiners, and additional sources.[21] The comprehensive nature of this dataset allows for an extension of previous work by determining if treatment seeking habits and previous suicidality differentiate suicide decedents who utilize certain methods. This study furthers the research previously done with the NVDRS by using data from 32 states, including multiple treatment seeking and suicide variables, and examining differences between those who use different methods. The present study will examine if treatment seeking, disclosure of previous suicidal thoughts, and previous SA differentiate those who died by suicide with a firearm versus another method. It is hypothesized that those who died by suicide via firearm will have sought less services, disclosed thoughts of suicide at lower rates, and have lower rates of prior SA compared to those who died by suicide using another method. In an exploratory manner, we will also examine if these differences hold when comparing those who died by firearm to those who died specifically by hanging (the second most lethal method for suicide) and poisoning (the most commonly used method in SA). Determining these differences will allow for a better understanding of method selection and more effective and customized means safety efforts.

Methods

The NVDRS dataset was provided by the CDC and as such was exempt from Institutional Review Board oversight. The NVDRS funds and supports states' data collects efforts. Data is collected from death records, corner/medical examiner reports, and law enforcement reports in order to provide comprehensive information on violent deaths.[21, 22] Examining data from multiple sources helps increase consistency and comprehension of the information in the data set. Each state manages data collection through their state department or subcontractor (e.g., medical examiner), and codes data for cases that occurred in their state. Abstractors are trained on how to code data included in the NVDRS data set, ongoing support (e.g., monthly calls; CDC, 2018) is provided and cases are reviewed to ensure accuracy. The NVDRS provides a coding manual (CDC, 2018) that includes information about how cause of death, circumstances, and weapon variables should be coded. For example, for the variable indicating if the decedent was ever in treatment for a mental health or substance use problem, coders are instructed to code "yes" if there is evidence in the decedent's file that the decedent had a current prescription for a psychiatric medication, had seen a mental health professional, or met the other listed criteria. For more information on the coding process of the NVDRS, please see resources provided by the CDC.[24]

This report follows the STROBE reporting guidelines for cross sectional studies. SPSS Statistical Package v26 was used to perform analysis. P-value is significant at the .05 level, and regressions were two-sided. A single, multivariable binary logistic regression was used to determine differences between suicide decedents who used a firearm in their suicide death and those who used another method. Method type (firearm vs. other) was included as the dependent variable, and current treatment, lifetime treatment, history of ideation, history of attempts, and disclosure of ideation were included as the independent variables. Multinomial logistic

regressions were used in exploratory analyses to determine differences between firearm suicide decedents and those who died by (1) poisoning and (2) hanging.

Results

See Table 1 for sample characteristics. The three most common methods of suicide were firearm (n = 117,126; 49.9%), hanging/strangulation/suffocation (n = 62,674; 26.7%), and poisoning (n = 35,937; 15.3%). Most decedents were not in treatment for a mental health or substance abuse disorder at the time of their death (n = 171,782; 73.2%), and most had not sought treatment in their lifetime (n = 155,756; 66.4%). A majority did not have a documented lifetime history of SI/plans (n = 188,562; 80.4%) or SA (n = 192,313; 82.0%) and had not disclosed SI/plans within the month prior to their death (n = 179,939; 76.7%).

Results from the binary logistic regression (Table 2) indicate that decedents who were in treatment for a mental health/substance use problem at the time of their death (OR = .846 [CI .816, .877]), had ever been in treatment for a mental health/substance abuse problem (OR = .749 [CI .724, .775]), or had previously attempted suicide before their death (OR = .444 [.434, .455]) were significantly less likely to use a firearm. Decedents with a recent disclosure of suicidal plans within the last month had higher odds dying suicide by firearm. (OR = 1.157 [CI 1.133, 1.182]) were significantly more likely to use a firearm. The two groups did not differ in terms of a history of SI/plans (OR = 1.157 [CI 1.133, 1.182]). Findings were consistent when restricting the sample to only men, women, and when covarying for age. Due to the large range of ages, analyses were conducted among a sample restricted to those aged 18-84 years old (n = 221,398), and results were unchanged. We repeated analyses while restricting inclusion to those states that have contributed data to each year of the NVDRS, findings did not change."

Results from the exploratory multinomial logistic regression (Table 3) were similar to those found in the binary logistic regression, with some notable differences. Compared to poisoning decedents, firearm decedents were significantly more likely to have a history of suicidal ideation (SI)/plans (OR = 1.188 [CI 1.149, 1.230]). Decedents who died by hanging and firearm decedents did not significantly differ on being in treatment for a mental health/substance abuse problem at the time of death (OR = .987 [.947, 1.028]). Due to the large range of ages, the exploratory multinomial regression was conducted among a sample restricted to those 18-84 years old. Results comparing poisoning to firearms remained unchanged. When comparing hanging to firearms, the age restricted sample found that those who died by firearm were more likely to be in treatment at the time of their death (p = .002; OR = .938 [CI .900, .977]); all other results were unchanged. See supplemental tables S1 through S4 for logistic regression results broken down by racial group.

Discussion

The present study examined differences on mental health/substance use treatment seeking behavior, prior SA, history of SI/plans, and disclosure of suicidal thoughts and plans preceding death between firearm decedents and those who died using other methods. As hypothesized, relative to those who died using other methods, firearm decedents were significantly less likely to have previously sought mental health treatment or be in mental health treatment at the time of their death. Additionally, firearm decedents were significantly less likely to have previously attempted suicide compared to those who died by a different method. Contrary to our hypothesis, those who died using a firearm were more likely to have disclosed their SI/plans in the month preceding their suicide death. There were no differences on rates of prior suicidal thoughts and

plans between firearm decedents and those who died using another method and a large majority of decedents had no history of suicidal thoughts.

Analyses examining specific subgroups of decedents (those who died by either poisoning or hanging) relative to firearm decedents had similar findings to those comparing firearm decedents with individuals who died by any other method; however, there were notable differences. Specifically, those who died by firearm were more likely than poisoning decedents to have had previous SI/plans and to have disclosed these thoughts to someone in the month prior to their death. Hanging and firearm decedents did not differ on being in mental health/substance use treatment at the time of their death.

The finding that firearm decedents were less likely to have previously attempted suicide is consistent with previous literature;[9] however, of note, a majority of decedents did not have a documented history of SA. This finding suggests those who use a firearm typically die on their first SA rather than using a firearm after having survived an earlier attempt using a less lethal method. Further, results consistently indicated that firearm decedents were less likely to engage with the mental health care system, suggesting that many evidence-based suicide prevention interventions are unlikely to reach those at risk of dying by firearm suicide given that they require individuals engage with the mental health system. An inability of our existing mental health care system to reach and help those in need highlights the importance of upstream or population-level interventions for firearm suicide prevention. Decedents whose highest level of education was a high school degree represented the largest percentage of deaths across all methods. A high school degree may be indicative of social/economic circumstances that increase risk for suicidal behaviors. In line with this, a previous study found low education level increases risk for suicide among men (Denney, Rogers, Krueger, & Wadsworth, 2009). Future longitudinal

research should explore a potential connection between educational attainment, suicide means, and suicidal behavior.

Upstream interventions can take many forms, and research has begun to answer questions on how this is best done. One possible avenue is to increase safe storage of firearms. Previous research has demonstrated that safe storage is associated with decreased risk of firearm suicide.[23] Implementation of such strategies, however, can be challenging. Practices to increase safe storage should include messages and messengers that are considered credible to firearm owners. For example, using messaging surrounding firearm safety that resonates with firearm owners and reflects their culture[24] may increase adherence with safe storage recommendations. Prior findings indicated effects were stronger among those who were politically conservative, lived in rural areas, and had greater support of gun rights[25], suggesting that this may be a way to reach those who have historically been considered hard to reach. Several studies have shown that law enforcement, military veterans, and service members are perceived to be more credible sources of information regarding firearm safety.[26,27] Leveraging these sources may be important in efforts to increase safe storage.

An unexpected yet promising finding from the present study was that those who died using a firearm were more likely to have disclosed SI/plans in the month preceding their death relative to those who died using other means. This finding suggests another important avenue for firearm suicide prevention. Those who die using a firearm are not doing so without any notable risk indicator, and rather are providing very important information to those around them. This finding also highlights the importance of increasing population-level understanding of means safety and possible mechanisms to limit access to lethal means. By increasing such knowledge, we can empower people to intervene and help friends and loved ones decrease suicide likelihood.

Further, training those outside the medical field in how to be most effective in conversations surrounding firearms safety may increase the reach and impact of such interventions. Additionally, increasing awareness of how Extreme Risk Protection Orders (ERPOs) work may be important so that individuals may feel more comfortable implementing such strategies if necessary. Several states have also developed maps showing firearm owners where firearms can be voluntarily and temporarily stored outside the home in times of crisis.[28] Increasing public understanding of such projects is important so that those who become aware of an individual's SI/plans may offer this information.

Notably, the effect size for this finding was relatively small relative to other findings. Firearm decedents were only 14% more likely to have disclosed their thoughts/plans and the large majority of participants had no known history of suicidal thoughts prior to their death. This suggests that, although firearm decedents are more likely to have disclosed thoughts/plans, disclosure is quite rare. Strategies to increase population level knowledge about risk factors and warning signs for suicide, as well as means safety, is needed to better equip a number of individuals to notice suicide risk and intervene.

Limitations and Conclusion

This project is not without limitation. Information about the specific type of mental health treatment or length of time of treatment was not able to be coded; both the quantity and quality of treatment might be important factors to consider in future work. It is not clear to whom suicidal thoughts were disclosed and the nature of these discussions. For example, it may be that certain groups (e.g., faith leaders) are more likely to be provided information regarding others' suicidal thoughts. A greater understanding of who is most likely to be informed about suicidal thoughts is an important area for future research so that interventions can be specifically tailored

to such groups. Specific information regarding the nature of the disclosure is also not available. For example, we do not know if disclosures were detailed conversations where an individual expressed their suicidal thoughts or if disclosures more passing comments (e.g., vague comments about wanting to die). Another limitation is that findings may be affected by the expansion of the NVDRS. For example, the NVDRS included 6 states at its inception in 2003 and currently involves 32. The original six states thus account for a disproportionate number of deaths and may impact findings. Additionally, given hindsight bias, it may be that after someone dies by suicide, those reflecting on it are more likely to see past events as a disclosure when, in reality, such events may not have been considered a disclosure by others. Limited access to sources of information may result in someone being coded as not having suicidal ideation, for example, when they did in fact experience suicidal ideation. This paper furthers our understanding of who is at risk to die by firearm suicide. Notably, those likely to die by firearm are unlikely to engage with mental health services, yet such services are often tasked with reducing access to lethal means. This study emphasizes the importance of community-based interventions in firearm suicide prevention. The finding that firearm decedents were more likely to have disclosed such thoughts suggests an important avenue for suicide prevention and warrants further research to better understand who these people are and what information is disclosed.

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Table 1. Sample Characteristics

	Total Sample	Firearm Decedents	Hanging Decedents	Poisoning Decedents
	N = 234,652	n = 117,126	n = 62,674	n = 35,937
Characteristic	N(%)	n(%)	n(%)	n(%)
Age				
M(SD)	46.27 (18.17)	49.20 (19.20)	39.82 (16.381)	48.36 (14.941)
Range	3 – 112	8 – 105	3 – 103	7 – 100
Sex				
Male	182,520 (77.8%)	101,296 (86.5%)	49,147 (78.4%)	17,994 (50.1%)
Female	52,072 (22.2%)	15,851 (13.5%)	13,513 (21.6%)	17,936 (49.9%)
Unknown	49 (<.01%)	22 (<.01%)	13 (<.01)	6 (<.01%)
Race				
White	205,966 (87.8%)	105,356 (89.9%)	52,543 (83.8%)	32,860 (91.4%)
Black/African American	15,228 (6.5%)	7,481 (6.4%)	4,334 (6.9%)	1,579 (4.4%)
American Indian/Alaskan Native	3,097 (1.3%)	1,196 (1.0%)	1,380 (2.2%)	322 (0.9%)
Asian/Pacific Islander	5,109 (2.1%)	1,150 (1.0%)	2,430 (3.9%)	556 (1.5%)
Other/Unspecified	1,962 (0.8%)	586 (0.5%)	827 (1.3%)	182 (0.5%)
Two or more races	2,843 (1.2%)	1,254 (10.1%)	950 (1.5%)	374 (1.0%)
Unknown	537 (0.2%)	150 (0.1%)	210 (0.3%)	64 (0.2%)
Military Affiliation				
No	179,231 (76.7%)	82,779 (71.0%)	52,128 (83.5%)	29,301 (81.9%)
Yes	40,654 (17.3%)	28,295 (24.3%)	6,160 (9.9%)	4,053 (11.3%)
Unknown	13,690 (5.9%)	5,589 (4.8%)	4,137 (6.6%)	1,409 (6.7%)
Marital Status				
Never married	80,781 (34.5%)	34,188 (29.2%)	28,552 (45.6%)	10,027 (27.9%)
Married	77,965 (33.3%)	44,795 (38.3%)	17,189 (27.4%)	10,800 (30.1%)
Widowed	13,777 (5.9%)	8,473 (7.2%)	1,830 (2.9%)	2,602 (7.2%)
Divorced	50,385 (21.5%)	24,357 (20.8%)	11,629 (18.6%)	10,674 (29.7%)
Separated	5,626 (2.4%)	2,738 (2.3%)	1,617 (2.6%)	979 (2.7%)
Single	3,226 (1.4%)	1,503 (1.3%)	1,096 (1.8%)	395 (1.1%)
Unknown	2,644 (1.1%)	1,000 (0.9%)	715 (1.1%)	427 (1.2%)
Education				
8th grade or less	7,513 (3.3%)	3,528 (3.1%)	2,820 (4.6%)	675 (1.9%)
Some high school	24,529 (10.7%)	11,566 (10.1%)	8,495 (13.8%)	2,798 (8.0%)
High school degree	71,562 (31.2%)	36,873 (32.3%	19,403 (31.5%)	9,993 (28.5%)
Some college	28,914 (12.6%)	14,561 (12.8%)	7,303 (11.9%)	4,543 (13.0%)
Associate's degree	13,207 (5.8%)	6,714 (5.9%)	2,981 (4.8%)	2,485 (7.1%)
Bachelor's degree	20,596 (9.0%)	9,590 (8.4%)	5,157 (8.4%)	3,551 (10.1%)
Master's degree	7,132 (3.1%)	3,265 (2.9%)	1,770 (2.9%)	1,305 (3.7%)
Advanced degree	3,222 (1.4%)	1,476 (1.3%)	766 (1.2%)	561 (1.6%)
Unknown	52,547 (22.9%)	26,478 (23.2%)	12,912 (21.0%)	9,142 (26.1%)

Differences between suicide decedents

Table 2. Logistic Regression Differences Between Method Selection (Other = 0, Firearm = 1)

Variable	Other Method n (%)	Firearm n (%)	OR (CI Lower, CI Upper)	p Value
Current treatment	38,589 (33.0%)	24,252 (20.7%)	.846 (.816, .877)	<.001
Lifetime history of treatment	47,695 (40.7%)	31,140 (26.6%)	.749 (.724, .775)	<.001
Lifetime history of ideation/plans	24,891 (21.3%)	21,159 (18.1%)	1.001(.978, 1.024)	.890
Lifetime history of suicide attempt(s)	29,796 (25.4%)	12,507 (10.7%)	.444 (.434, .455)	<.001
Past month disclosure of ideation/plans	27,220 (23.2%)	27,462 (23.4%)	1.157 (1.133, 1.182)	<.001

* All variables binary (no/yes) and coded as 0/1
*Covaried for race, gender, and marital status

Table 3. Exploratory Multinomial Regression Comparing Firearms to Poisoning and Hanging

Variable	Poisoning				Hanging			
	n (%)	OR (95% CI)	Wald	p	n (%)	OR (95% CI)	Wald	p
Current treatment	16,031 (44.6%)	.532 (.505, .561)	548.855	<.001	17,414 (27.8%)	.987 (.947, 1.028)	.394	.530
Lifetime history of treatment	18,274 (50.9%)	.855 (.811, .900)	32.260	<.001	22,819 (36.4%)	.765 (.736, .796)	183.215	<.001
Lifetime history of ideation/plans	7,427 (20.7%)	1.189 (1.149, 1.230)	99.557	<.001	14,103 (22.5%)	.895 (.872, .920)	66.4555	<.001
Lifetime history of suicide attempt(s)	11,430 (31.8%)	.394 (.382, .407)	3171.070	<.001	14,463 (23.1%)	.473 (.460, .487)	2714.068	<.001
Past month disclosure of ideation/plans	8,902 (24.8%)	1.064 (1.031, 1.097)	15.064	<.001	14,519 (23.2%)	1.142 (1.114, 1.171)	107.979	<.001

* All variables binary (no/yes) and coded as 0/1
*Covaried for race, gender, and marital status