Characteristics of Veteran and Civilian Suicide Decedents: A Sex-Stratified Analysis

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Abstract

Introduction: Few studies have examined characteristics distinguishing Veteran and civilian suicide decedents. An understanding of unique risk factors for Veteran suicide is critical to develop effective preventive interventions. This is particularly imperative for female Veterans, who have near double the suicide mortality rate of same-aged female civilians. The objectives of this study were to examine whether Veteran and civilian suicide decedents differed on risk factors and suicide-event characteristics, and to determine whether predictors changed based on sex.

Methods: Data from 116,515 suicides collected by the National Violent Death Reporting System in 27 states between 2003 and 2015 were analyzed in 2018 in sex-stratified analyses. Logistic regression models examined population differences in risk factors and suicide-event characteristics.

Results: Relative to male civilians, male Veterans were more likely to have a contributing physical health problem (AOR=1.10, 95% CI=1.06, 1.14) and to use a firearm for their suicide (AOR=1.41, 95% CI=1.36, 1.47); they were less likely to have substance use problems (AOR=0.70, 95% CI=0.66, 0.75), depressed mood (AOR=0.93, 95% CI=0.90, 0.97), or financial problems (AOR=0.91, 95% CI=0.86, 0.97). Female Veterans were more likely to use a firearm for their suicide (AOR=1.39, 95% CI=1.19, 1.63) relative to female civilians.

Conclusions: Firearm use as a suicide method was a key distinguishing feature of Veteran suicide. Means restriction and firearm safety are pertinent to preventing Veteran suicide. Given low utilization of mental health care and frequent presence of physical health problems in this population, safe storage messages may have a greater preventative impact if delivered in primary care or other non-psychiatric settings.

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INTRODUCTION

Veteran suicide is a pressing concern. In 2016, the age- and sex-adjusted suicide mortality rates for Veterans were 1.5 times higher than civilians, with female Veterans having nearly double (1.8 times) the suicide mortality rate of same-aged civilian females.[1] Although previous studies have identified important risk factors for Veteran suicide,[2,3] many of these studies have focused on Veterans Health Administration samples. Yet, among the 20 Veterans who die by suicide each day, approximately 14 have not received Veterans Health Administration services/care in the past year. Studies utilizing population-based samples are of great importance for better understanding Veteran suicide, yet very few exist. One population-based study found that firearm use as a suicide method distinguished male Veterans from matched civilian suicide decedents.[4] Another study indicated female Veterans were also more likely to use firearms as a suicide method relative to female civilians, but utilized a small sample.[5] Very little is known regarding the risk factors that differentiate female Veteran and female civilian suicide decedents,[6] despite a growing female population in the military. Additional research on the precipitants and characteristics of suicide deaths is greatly needed for both male and female Veterans.

METHODS

Data came from the Restricted Access Database from the National Violent Death Reporting System (NVDRS) administered by the Centers for Disease Control and Prevention.[7] The study was restricted to the secondary analysis of a fully de-identified dataset and IRB approval was not required. The NVDRS collects data from participating states regarding violent deaths, including suicides, and provides de- identified information obtained from death certificates, coroner/medical examiner reports, law enforcement reports, secondary sources, and abstractor reports. The NVDRS can reliably estimate Veteran suicide[8] and this study included 116,515 suicide decedents with known military status and known circumstances for their suicide, occurring between 2003 and 2015 in 27 states. Veteran status was determined from national standardized death certificates in the section "Ever a member of U.S. Armed Forces."

Measures

Demographic variables included age, race, ethnicity, residence (Northeast, Midwest, South, and West), education level, marital status, and year of death.

The following health and mental health variables were coded as yes or no/unknown: diagnosed mental health problem, depressed mood, alcohol dependence/problem, non-alcohol substance use dependence/problem, suicide attempt history, past mental health treatment, and contributing physical health problems.

The following social and occupational variables were coded as yes or no/unknown: problems with intimate partner, family member, or friend/associate (collapsed into single interpersonal problems category); problems with job/employment; criminal/civil legal issues; and recent death of family/friend.

Two suicide event variables coded as yes or no/unknown were: victim left suicide note/communication and recent disclosure of suicidal thoughts/plan. Location of suicide was dichotomized to residence and other. Suicide methods were grouped into: firearms, overdose/poisoning, hanging/strangulation/suffocation, and other.

Statistical Analysis

Data were analyzed utilizing SPSS, version 22.0 and Stata, version 15 in 2018. Chi-square and *t*-test analyses examined sex-stratified differences between Veterans and non-Veterans for demographic variables. A series of logistic regression models examined Veteran status and risk variables without adjustments (Model 1) and with demographic adjustments for age, sex, race, ethnicity, education level, marital status, year of death, and residence (Model 2). Propensity score-based Marginal Mean Weighting with Stratification[9] was then used to balance Veterans and non-Veterans on the demographic variables outlined above and health/mental health, social/occupational, and suicide event/method variables (Model 3). Given this study's interest in outcomes among males and females, separate analyses were conducted by sex. The adaptive False Discovery Rate method,[10] which uses an adaptive stepwise procedure for determining significance for multiple comparisons, was used due to exploratory nature of these analyses.

RESULTS

Demographic characteristics and differences based on Veteran status appear in Table 1. Endorsement percentages and unadjusted/adjusted ORs for the health/mental health, social/occupational, and suicide event/method variables are presented for males in Table 2 and females in Table 3. In Model 3, male Veterans had greater adjusted odds of using a firearm as the suicide method, having a contributing physical health problem, and leaving a suicide note than male civilians. Male Veterans had lower adjusted odds of having substance use problems, depressed mood, financial problems, a recent death of a loved one, or disclosure of suicidal intent in the month prior to their death. Among females, the only significant difference in Model 3 was greater adjusted odds of using a firearm as the method for suicide for Veterans.

DISCUSSION

Consistent with past reports,[4,5] the current findings showed that male Veterans were more likely to use firearms as the method of suicide compared with civilians. Furthermore, male Veterans were more likely to report contributing physical health problems. Although this may be a byproduct of greater overall prevalence of medical morbidity in the Veteran population,[11] these findings suggest that suicide prevention efforts in physical health medical settings (e.g., primary care, pain clinics) are especially indicated. Surprisingly, male Veterans were less likely than male civilians to have had depressed mood, alcohol/substance use, or financial problems. This, combined with the low utilization of mental health care among suicide decedents, suggests that screening and prevention efforts in mental health settings is insufficient.

Female Veteran suicide decedents only differed from female civilians on one suicide characteristic—use of firearm as suicide method. The interpersonal theory of suicide stipulates that in order to die by suicide, one must have both desire and acquired capability to die by suicide.[12] This finding suggests that differences in factors associated with acquired capability (e.g., exposure/access/comfort with firearms), rather than factors associated with suicidal desire (e.g., depressed mood, interpersonal problems), drives higher suicide mortality rates among Veterans compared with civilians for both males and females. As such, an increased focus on factors leading to greater capability for suicide and access to lethal means is especially warranted for Veterans.

Limitations

Data in the NVDRS only represent what was explicitly documented in death certificates, medical/coroner reports, and law enforcement reports, thus the circumstances and contributing stressors to suicide deaths are likely underreported. The U.S. states participating in the NVDRS had varying lengths of time of participation and are not nationally representative. The NVDRS does not distinguish active duty personnel from Veterans, and does not include military-related variables such as branch, service era, or deployments. Most variables were dichotomously coded, limiting ability to assess levels of severity.

Despite being the largest known study of female suicide decedents, there was limited power to detect differences for low-frequency variables (e.g., legal problems, recent loss) for female Veterans. Although suicide is a leading cause of death, base suicide mortality rates are quite low, making it difficult to predict. Statistical methods were used to balance possible confounds, yet unobserved confounders likely existed, which precludes the ability to make causal claims regarding impact of Veteran status on suicide-event variables.

CONCLUSIONS

Ownership of personal firearms in Veterans is greater than in the civilian population[13] and presence of a gun in the home increases the likelihood of suicide.[14] A growing body of evidence suggests means restriction is an effective method for reducing suicide,[15] thus education regarding safe storage within the Veteran population is needed. Although the Veterans Administration has engaged in initiatives around this area, an expansion of reach and services is needed to capture Veterans not utilizing Veterans Administration care. Given the low utilization of mental health care and frequent presence of physical health problems in this population, safe storage messages may have a greater preventive impact if delivered in primary care or other non-psychiatric settings.

ACKNOWLEDGMENTS

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Table 1.

Demographics of Suicide Decedents From 2003–2015 Collected by the NVDRS

Variable[a]	M civilian n=67,716	M Veteran n=22,707	F civilian n=25,251	F Veteran n=841
Age, mean (SD)	43.21 (23.4)	[b]**58.84 (22.2)**	[c]**46.84 (21.4)**	44.69 (13.6)
Race/Ethnicity, %				
White, non-Hispanic	82.6	[d]**90.1**	[e]**86.1**	81.1
Black, non-Hispanic	**6.7**	5.3	4.6	**9.8**
Hispanic	**5.6**	2.4	3.9	4.2
Other	**5.1**	2.2	5.4	4.9
Education, %				
Less than high school	[f]**19.2**	10.1	[g]**12.5**	3.6
High school diploma/GED	43.2	**46.0**	**37.4**	31.4
Some college/Associates	21.9	**25.9**	28.9	**40.6**
Bachelor's or higher	15.7	**18.0**	21.2	24.4
Marital status, %				
Single/Never married	[h]**40.7**	15.3	25.3	22.7
Divorced/Separated	22.3	**26.5**	30.1	[i]**35.3**
Married/Partnered	33.3	**46.0**	35.9	37.8
Widowed	3.5	**12.2**	**8.7**	4.2
Region, %				
Northeast	[j]**16.8**	14.6	[k]**16.0**	9.9
Midwest	**16.9**	14.3	15.5	12.6
South	41.5	**44.5**	42.7	**46.4**
West	24.8	**26.7**	25.8	**31.2**

Note: Boldface indicates statistical significance (p<0.01) for t-tests and chi-square analyses examining post-hoc adjusted residuals of individual cells.

[a]Tests were stratified by sex (male civilians to male Veterans; female civilians to female Veterans).

[b]$t_{(40848)}$=90.4, p<0.001.

[c]$t_{(983)}$=4.4, p<0.001.

[d]$\chi^2_{(3)}$=847.4, p<0.001.

[e]$\chi^2_{(3)}$=47.7, p<0.001.

[f]$\chi^2_{(3)}$=692.1, p<0.001.

[g]$\chi^2_{(3)}$=65.6, p<0.001.

[h]$\chi^2_{(3)}$=6307.8, p<0.001.

[i]$\chi^2_{(3)}$=32.2, p<0.001.

[j]$\chi^2_{(3)}$=179.6, p<0.001.

$^{k}\chi^2$ (3)=35.2, p<0.001.

NVDRS, National Violent Death Reporting System; M, male; F, female.

Table 2.

ORs for Precipitants and Characteristics of Suicide: Comparisons of Male Veterans and Civilians

Characteristic	M civilian *n*=67,716 %	M Veteran *n*=22,707 %	Model 1[a,b] OR (95% CI)	Model 2[a,c] AOR (95% CI)	Model 3[a,d] AOR (95% CI)
Health/MH					
Current MH problem	40.4	38.7	**0.89 (0.87, 0.92)**	**0.93 (0.90, 0.96)**	1.0 (0.97, 1.04)
Depressed mood	40.4	41.1	1.02 (1.00, 1.06)	**0.90 (0.87, 0.93)**	**0.93 (0.90, 0.97)**
Alcohol problem	20.3	15.7	**0.73 (0.70, 0.76)**	**0.80 (0.77, 0.84)**	**0.91 (0.87, 0.96)**
Other substance problem	17.1	7.6	**0.40 (0.38, 0.42)**	**0.65 (0.61, 0.69)**	**0.70 (0.66, 0.75)**
Suicide attempt history	17.5	12.7	**0.69 (0.66, 0.72)**	**0.91 (0.87, 0.95)**	0.97 (0.92, 1.03)
Treatment for MH (ever)	34.6	31.3	**0.86 (0.83, 0.90)**	**0.90 (0.87, 0.94)**	0.97 (0.93, 1.00)
Physical health problem	17.2	36.8	**2.79 (2.70, 2.88)**	**1.06 (1.02, 1.11)**	**1.10 (1.06, 1.14)**
Social/Occupational					
Interpersonal problem	41.6	30.6	**0.62 (0.60, 0.64)**	**0.95 (0.91, 0.98)**	0.99 (0.95, 1.02)
Job problem	15.0	11.1	**0.71 (0.68, 0.74)**	**0.82 (0.78, 0.86)**	1.02 (0.97, 1.08)
Financial problem	12.7	10.9	**0.84 (0.80, 0.88)**	**0.79 (0.75, 0.83)**	**0.91 (0.86, 0.97)**
Legal problem	15.8	10.7	**0.64 (0.61, 0.67)**	**0.85 (0.81, 0.90)**	0.95 (0.89, 1.00)
Recent loss	7.4	8.7	**1.20 (1.14, 1.27)**	**0.87 (0.82, 0.93)**	**0.89 (0.83, 0.95)**
Suicide event					
Location (home)	73.3	78.8	**1.35 (1.30, 1.40)**	**1.05 (1.01, 1.09)**	0.99 (0.95, 1.03)
Suicide note	31.6	34.5	**1.14 (1.10, 1.18)**	**1.07 (1.04, 1.12)**	**1.09 (1.05, 1.14)**
Suicide intent disclosed	28.2	26.7	**0.93 (0.89, 0.96)**	**0.94 (0.91, 0.98)**	**0.95 (0.91, 0.99)**
Suicide method					
Firearm	53.3	70.4	**2.08 (2.02, 2.15)**	**1.47 (1.44, 1.55)**	**1.41 (1.36, 1.47)**
Hanging/Suffocation	28.3	14.7	**0.44 (0.42, 0.45)**	**0.68 (0.65, 0.72)**	**0.71 (0.67, 0.74)**
Poison/Overdose	11.7	10.4	**0.87 (0.83, 0.92)**	**0.83 (0.78, 0.87)**	0.96 (0.91, 1.02)
Other method	6.7	4.5	**0.65 (0.62, 0.71)**	**0.73 (0.67, 0.79)**	**0.74 (0.68, 0.80)**

Note: Boldface indicates statistical significance ($p<0.05$) for Veteran status following adjustment for multiple comparisons using the false discovery rate procedure, with civilians coded as the reference category.

[a] Sample sizes for each analysis differed as information on all covariates and outcomes were not available for all participants. Missing data frequencies did not exceed 5% of initial sample utilized for this study.

[b] Model 1 adjusted for no covariates.

[c] Model 2 adjusted for demographic factors including age, race, ethnicity, education level, marital status, year of death, and region.

[d] Model 3 adjusted for demographic variables outlined in Model 2 as well as health/mental health, social/occupational, and suicide event/method variables using propensity score-based marginal means weighting with stratification.

M, male; MH, mental health.

Table 3.

ORs for Precipitants and Characteristics of Suicide: Comparisons of Female Veterans and Civilians

Characteristic	F civilian *n*=25,251 %	F Veteran *n*=841 %	Model 1[a,b] OR (95% CI)	Model 2[a,c] AOR (95% CI)	Model 3[a,d] AOR (95% CI)
Health/MH					
Current MH problem	63.4	61.5	0.92 (0.80, 1.06)	0.90 (0.77, 1.03)	0.99 (0.85, 1.17)
Depressed mood	42.4	43.9	1.06 (0.92, 1.22)	0.99 (0.85, 1.14)	1.00 (0.85, 1.17)
Alcohol problem	15.7	14.3	0.91 (0.75, 1.11)	0.87 (0.71, 1.07)	0.85 (0.68, 1.07)
Other substance problem	18.2	14.6	**0.77 (0.64, 0.94)**	**0.76 (0.62, 0.93)**	0.79 (0.63, 0.99)
Suicide attempt history	33.7	33.3	0.98 (0.85, 1.14)	0.93 (0.80, 1.09)	1.04 (0.88, 1.23)
Treatment for MH (ever)	55.7	53.0	0.90 (0.78, 1.03)	**0.85 (0.74, 0.98)**	0.93 (0.79, 1.09)
Physical health problem	23.3	20.6	0.85 (0.72, 1.01)	0.88 (0.73, 1.05)	1.04 (0.85, 1.28)
Social/Occupational					
Interpersonal problem	35.9	39.1	1.14 (1.00, 1.32)	1.02 (0.87, 1.18)	0.93 (0.79, 1.09)
Job problem	8.5	10.9	**1.32 (1.06, 1.65)**	1.17 (0.93, 1.47)	1.09 (0.85, 1.39)
Financial problem	9.7	9.6	0.99 (0.78, 1.25)	0.91 (0.71, 1.15)	0.90 (0.69, 1.18)
Legal problem	7.6	7.3	0.95 (0.73, 1.24)	0.89 (0.68, 1.17)	0.85 (0.64, 1.15)
Recent loss	9.7	8.1	0.82 (0.64, 1.05)	0.90 (0.70, 1.18)	0.98 (0.72, 1.32)
Suicide event					
Location (Home)	81.6	80.0	0.90 (0.76, 1.07)	0.94 (0.79, 1.12)	0.95 (0.74, 1.08)
Suicide note	39.9	43.6	**1.17 (1.02, 1.34)**	**1.17 (1.02, 1.35)**	1.12 (0.96, 1.31)
Suicide intent disclosed	27.0	28.9	1.10 (0.95, 1.28)	1.04 (0.89, 1.21)	1.11 (0.94, 1.32)
Suicide method					
Firearm	31.4	41.0	**1.52 (1.32, 1.75)**	**1.44 (1.24, 1.67)**	**1.39 (1.19, 1.63)**
Hanging/Suffocation	22.4	15.8	**0.65 (0.54, 0.79)**	**0.68 (0.56, 0.83)**	**0.69 (0.56, 0.86)**
Poison/Overdose	38.4	36.5	0.92 (0.80, 1.07)	0.94 (0.89, 1.10)	0.96 (0.82, 1.13)
Other method	7.9	6.7	0.84 (0.63, 1.10)	0.87 (0.65, 1.15)	0.86 (0.64, 1.17)

Note: Boldface indicates statistical significance (*p*<0.05) for Veteran status following adjustment for multiple comparisons using the false discovery rate procedure, with civilians coded as the reference category.

[a] Sample sizes for each analysis differed as information on all covariates and outcomes were not available for all participants. Missing data frequencies did not exceed 5% of initial sample utilized for this study.

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[c] Model 2 adjusted for demographic factors including age, race, ethnicity, education level, marital status, year of death, and region.

[d] Model 3 adjusted for demographic variables outlined in Model 2 as well as health/mental health, social/occupational, and suicide event/method variables using propensity score-based marginal means weighting with stratification.

F, female; MH, mental health.