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An analysis of suicides among first responders — Findings from the National Violent Death Reporting System, 2015–2017 ⋆

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Abstract

Introduction: First responders, including law enforcement officers (LEOs), firefighters, emergency medical services (EMS) clinicians, and public safety telecommunicators, face unique occupational stressors and may be at elevated risk for suicide. This study characterized suicides among first responders and identifies potential opportunities for additional data collection.

Methods: Using suicides identified from the three most recent years of National Violent Death Reporting System data with industry and occupation codes from the NIOSH Industry and Occupation Computerized Coding System (2015–2017), decedents were categorized as first responders or non-first responders based on usual occupation. Chi-square tests were used to evaluate differences in sociodemographic and suicide circumstances between first and non-first responders.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Results: First responder decedents made up 1% of all suicides. Over half of first responders (58%) were LEOs, 21% were firefighters, 18% were EMS clinicians, and 2% were public safety telecommunicators. Compared to non-first responder decedents, more first responders served in the military (23% vs. 11%) and used a firearm as the method of injury (69% vs. 44%). Among first responder decedents for whom circumstances were known, intimate partner problems, job problems, and physical health problems were most frequent. Some common risk factors for suicide (history of suicidal thoughts, previous suicide attempt, alcohol/substance abuse problem) were significantly lower among first responders. Selected sociodemographics and characteristics were compared across first responder occupations. Compared to firefighters and EMS clinicians, LEO decedents had slightly lower percentages of depressed mood, mental health problems, history of suicidal thoughts, and history of suicide attempts.

Conclusions: While this analysis provides a small glimpse into some of these stressors, more detailed research may help inform future suicide prevention efforts and interventions.

Practical application: Understanding stressors and their relation to suicide and suicidal behaviors can facilitate suicide prevention among this critical workforce.

Keywords

Suicide prevention; Emergency medical services; Public safety telecommunicator; Surveillance; Firefighter; Law enforcement

1. Introduction

The recent Surgeon General's "Call to Action to Implement the National Strategy for Suicide Prevention" highlighted suicides as a significant public health problem (U.S. DHHS, 2021). In 2019, there were over 47,500 suicide fatalities and an estimated 1.4 million suicide attempts in the United States. The causes of suicide are complex and involve many personal, sociodemographic, medical, and economic factors (De Berardis, Martinotti & Di Giannantonio, 2018; Stone, Holland, Bartholow, Crosby & Davis, 2017). One potential risk factor is occupation; the data suggest that several occupations appear to be at higher risk for suicide, including first responders (Pennington, Ylitalo, Lanning, Dolan, & Gulliver, 2021; Roberts, 2019; SAMHSA, 2018). First responders include law enforcement officers (LEOs), firefighters (FFs), emergency medical services (EMS) clinicians which includes emergency medical technicians (EMTs) as well as paramedics, and public safety telecommunicators. These occupations are crucial to ensuring public safety, public health, and national security (Benedek, Fullerton, & Ursano, 2007; SAMHSA, 2018). Unfortunately, the nature of these occupations can cause unhealthy and excessive levels of stress in those who fill them. This stress can be acute (associated with a specific incident) or chronic (an accumulation of day-to-day stress) (Haugen, Evces, & Weiss, 2012). In times of crisis (i.e., epidemics, natural disasters), first responders' occupational stress may increase (Alexander & Klein, 2006; Laufs & Waseem, 2020). First responders may also experience moral injury (defined as the loss of trust in oneself, leaders, and systems) during crises, as they may be forced to make critical decisions or allocate resources based on resource availability, rather than ethical principles or best practices (Shay, 2014; Williams, Brundage, & Williams, 2020). Occupational stress in first responders is associated with increased risk of adverse mental

health issues, including hopelessness, anxiety, depression, and posttraumatic stress, as well as suicidal behaviors, including suicide ideation, planning, and attempts (Bentley, Crawford, Wilkins, Fernandez, & Studnek, 2013; CDC, n.d.c; Violanti et al., 2016). First responders who served in the military may be at even higher risk for experiencing these adverse issues (Bartlett, Smith, Tran, & Vujanovic, 2018; Stanley, Hom, & Joiner, 2016; US VA, 2017). Prior research has documented significantly higher rates of clinical depression, sleep disturbance, and posttraumatic stress symptom severity among career firefighters who were military veterans compared to their non-veteran peers, although all effect sizes were small (Bartlett et al., 2018).

Previous research has documented elevated rates of suicides among first responders, compared to the general adult population. An analysis of state death registry data in Arizona revealed that the odds of EMTs dying by suicide were 1.39 times greater than the odds of dying by suicide among all others in the general adult population during the same period, adjusting for gender, age, race, and ethnicity (adjusted odds ratio: 1.39, 95% confidence interval [CI]: 1.06–1.82) (Vigil et al., 2019). An Australian retrospective mortality analysis compared suicide rates among emergency and protective service workers (including EMS clinicians, LEOs, and FFs) and workers in other occupations from 2001-2012 (Milner, Witt, Maheen, & LaMontagne, 2017). Results indicated the emergency and protective services workers had higher age-adjusted suicide rates than workers in other occupations (22.4 per 100,000 for males and 7.8 for females vs. 15.5 per 100,000 for males and 3.4 for females). The same study also documented that EMS clinicians had one of the highest suicide rates among emergency and protective service workers in the study.

A 2021 analysis of National Occupational Mortality Surveillance System (NOMSS) data found FFs and EMTs had higher proportionate mortality ratios (PMRs) for suicide than the general U.S. working population over a non-consecutive, 10-year period (FF PMR = 172, 95% CI:153–193; EMT PMR = 124, 95% CI:99–153) (Vigil et al., 2021), meaning the former group was 72% more likely to die by suicide than the general working population and the latter group 24% more likely. Another recent analysis of NOMSS data revealed a significantly higher proportion of deaths from suicide for LEOs compared to all other U.S. decedents who were employed during their lifetime (PMR = 154, 95% CI:147–162) (Violanti & Steege, 2021). In other words, LEOs were 54% more likely to die of suicide than all decedents with a reported occupation.

Among the U.S. adult population 18 and older including all persons regardless of employment status, 5% had serious thoughts of suicide, 1% made plans to commit suicide, and 0.5% attempted suicide during a one-year period (CBHSQ, 2022). In a national, crosssectional sample of U.S. FFs, Stanley, Hom, Hagan, and Joiner (2015) found that nearly half (46.8%) reported suicidal ideation, 19.2% reported planning a suicide, and 15.5% reported attempting suicide during their careers. A systematic review of studies on suicidal thoughts and behaviors among LEOs, FFs, and EMS clinicians found higher rates of reported suicidal thoughts and suicide attempts among these workers, compared to the general population; however, the authors emphasized the limitations of the studies they reviewed and the need for greater methodological rigor to better understand the issue (Stanley et al., 2016).

This paper uses data from the 2015–2017 National Violent Death Reporting System (NVDRS) to characterize suicides among first responders identified based on occupation codes assigned to the usual occupation field from the death certificate. The study question was "what are the characteristics of suicides among first responders, and how do they compare to characteristics of suicides among non-first responders?" The authors were also interested in exploring the characteristics of suicides across types of first responders to determine similarities and differences.

2. Methods

2.1. Data

Data from the 2015–2017 NVDRS were used for this analysis because these three years were the only years that included industry and occupation codes at the time of data analysis. The NVDRS is an active state-based surveillance system funded by the CDC (CDC, 2021). The system collects data on all violent deaths, including suicides. The NVDRS combines data from three required sources—death certificates, coroner or medical examiner (C/ME) reports, and law enforcement reports—into a single record. For death certificates, funeral directors record demographic information from next of kin and cause of death is recorded by an attending physician or the local C/ME. C/MEs are also responsible for conducting medicolegal death investigations, including investigating violent or sudden deaths and may ask family, friends, employers, and other informants questions to help determine an official cause of death. Law enforcement reports also provide information about the fatality and may involve statements from family, friends, employers, bystanders, or other informants. The NVDRS provides trained abstractors in participating jurisdictions with a framework to review these records and combine information from these separate sources into one single source. Abstractors code variables according to standardized CDC guidance (CDC, 2021) and create incident narratives based upon the C/ME and law enforcement reports that include a description of the precipitating circumstances of death. By combining data from these sources, the NVDRS provides a comprehensive report of circumstances contributing to violent deaths such as mental health issues, toxicology at time of death, and job or financial problems (Blair, Fowler, Jack, & Crosby, 2016; CDC, 2020; CDC, n.d.a).

For the years used in this study (2015–2017), data were not available for all states/territories as jurisdictions began reporting to the NVDRS in different years. In 2015, 27 states and jurisdictions participated; in 2016, 32 states and jurisdictions participated; and in 2017, 37 states and jurisdictions participated (Table 1). Data were included for all suicides, regardless of state residency status (i.e., state of residence or state where the suicide occurred).

2.2. Industry and occupation Coding

The NVDRS data include decedents' usual industry and occupation based on death certificate information but have not historically included standardized codes for this information. To fill this gap, coding experts from the National Institute for Occupational Safety and Health (NIOSH) used the CDC's NIOSH Industry and Occupation Computerized Coding System (NIOCCS 3.0) to assign 2010 Standard Occupational Classification (SOC) codes to the 2015–2017 NVDRS data using the decedents' usual occupation field as

reported on death certificates (CDC, n.d.b). Codes assigned by NIOCCS were verified by NIOSH coders.

2.3. Case selection

The NVDRS defines suicide as a death resulting from the intentional use of force against oneself, classified by ICD-10 underlying cause of death codes X60–X84, Y87.0, and U03 (Wilson et al., 2022). First responder deaths by suicide were selected from the NVDRS based on two primary variables. The “manner of death” variable was used to identify all suicides. Occupation codes assigned to the usual occupation field from the death certificate were used to identify first responders. The 2010 SOC codes from NIOCCS were used to identify EMTs and paramedics (i.e., EMS clinicians) (SOC code 29-2041), LEOs (SOC codes 33-1012 and 33-3051), FFs (SOC codes 33-1020, 33-1021, 33-2010, and 33-2011), and public safety telecommunicators (SOC code 43-5031). Although information was not available to delineate, first responders may be paid, unpaid, and/or volunteer. While the usual occupation from the death certificate had to implicitly identify the decedent as a first responder to have been included, there was no attempt to assess whether the first responder was working or not at the time of suicide. For comparison purposes, all other occupations were combined into a non-first responder category. It should be noted that the category that included non-first responders included decedents that were identified as homemaker, retired, student, unable to work for various reasons, military, and missing. Both the first responder and non-first responder categories included workers and non-workers. About 10% of the total had missing or unknown occupations. For this study, all suicide deaths were included and categorized into the appropriate category based on the usual occupation field from the death certificate regardless of whether they were working at the time of death. While the death did not have to occur at work, the authors did restrict the NVDRS records to individuals aged 16 to 64 years at the time of death, as those are the ages widely accepted as ‘working age.’

2.4. Analysis

For this analysis, the authors grouped all first responders together and compared them to non-first responders. Descriptive statistics were reviewed for first responders and non-first responders by various demographics (sex, age group, race/ethnicity, marital status, and education). To determine specific circumstances that may have been a factor in the suicide death, cases were subset to only those where circumstances were known. This subset was also explored for mental health issues (history of mental illness, current or former mental health diagnosis, treatment, and current depressed mood), and associated contributing factors (financial problems; intimate partner problems related to either a current or former relationship; job problems such as tensions with coworkers, poor performance, fear of being laid off, or difficulty finding a job; or substance abuse) (CDC, 2021). It is important to note that the accuracy and completeness of the information in the NVDRS is dependent on the information that is provided by the decedents’ employers, friends or family members, or the coroner. Chi-square analyses were used to determine statistically significant differences at $p = 0.05$ between certain demographics, mental and physical comorbidities, potential contributing factors, and substance use at time of death for first responders and non-first responders. All p-values were adjusted for multiple comparisons

using the Bonferroni correction and adjustment procedure. Additionally, sociodemographic characteristics and other selected indicators were compared across types of first responders. While the authors tested a priori hypotheses to identify statistical differences between first responders and non-first responders, a priori hypotheses regarding differences across first responder groups were not tested. When exploring the more detailed data, it was determined that the numbers were much smaller, which would have significantly increased chances of making a type 2 error.

3. Results

From 2015-2017, 61,579 individuals died by suicide, with 676 of these deaths (1%) involving first responders (Table 2) from the states that provided data to the NVDRS for the 3-year period. Of the 676 first responder suicides, 58% were LEOs, 21% were FFs, 18% were EMS clinicians, and 2% were public safety telecommunicators.

Most first responder and non-first responder decedents were male (88% and 76%, respectively). Deaths by suicide were spread evenly across all age groups for first responders and non-first responders, except for those aged 16–24 years of age, who had the smallest proportion of deaths by suicide. Mean ages at suicide for first responders and non-first responders (43.9 years vs. 41.1 years) were significantly different (p <0.0001; data not shown). Compared to non-first responders, first responders were more likely to be male (p < 0.0001), married or in a civil union or domestic partnership (p < 0.0001), have completed some college or have a college degree (p < 0.0001), and have served in the military (p < 0.0001) (Table 2). First responders were more likely than non-first responders to have used a firearm as the method of injury for suicide (69% vs. 44%, p < 0.0001) (Table 2).

Suicides were explored in more detail by subsetting cases to only those where circumstances were known (56,408 total cases: 623 first responders and 55,785 non-first responders). Ninety-two percent (n = 623) of the first responder decedents had known circumstances, while just under 92% of non-responder decedents had known circumstances (Table 3). Proportions of decedents perceived to be depressed at the time of death, who were using alcohol at the time of death, or had recent criminal problems or financial problems that appeared to contribute to the suicide were not significantly different for first responders and non-first responders (Table 3). Interestingly, some common risk factors for suicide (current mental health problem [p = 0.005], history of suicidal thoughts [p < 0.0001], history of suicide attempt [p < 0.0001], and current [p = 0.005] or history of mental health or substance abuse treatment [p = 0.030]) were lower among first responders, and some of these differences were statistically significant. However, first responders were more likely to have intimate partner problems (p < 0.0001), job problems (p < 0.0001), and physical health problems (p = 0.001) that appeared to contribute to the suicide compared to non-first responders. While first responders were less likely than non-first responders to have had a reported alcohol or substance abuse problem (p = 0.0002, p < 0.0001), the mean number of substances in the decedent's body found through toxicology testing was significantly higher for first responders (4.5 vs. 3.3 [p < 0.0001]; data not shown).

Selected sociodemographics and characteristics were compared across first responder occupations (Table 4). Data for public safety telecommunicator suicides were not included in this sub analysis due to small cell sizes. While there were similarities across the first responder groups, there were also important differences. The leading method of injury for suicide across all first responder groups was a firearm (70%). The percentage of LEOs who served in the military (26%) was larger than the percentage of either FFs or EMS who served (19% and 18%, respectively). Hanging or strangulation was the second leading method for all first responders, and EMS and FFs used this method more often than LEOs (24% and 27% vs. 13%, respectively). Suicides where circumstances were known were also explored in more detail by first responder occupations (Table 5). Again, there were similarities across the first responder group, but there were also important differences. For example, a greater proportion of EMS (62%) clinicians had a perceived current mental health problem compared to other first responders (40% [LEOs] & 47% [FFs]).

4. Discussion

First responders, specifically LEOs, FFs, and EMS, are almost always first on the scene of an incident or natural disaster, ensuring the safety of the public (SAMHSA, 2018). The work that these responders do on a day-to-day basis are inherently dangerous (Plat, Frings-Dresen, & Sluiter, 2011) due to the physical nature of the activities and the environmental exposures that are often encountered. Conversely, while 9-1-1 telecommunicators are not physically on scene and do not have a physically strenuous job, they receive the first notification of an emergency; are often the only lifeline to a person until other first responders arrive; and are exposed to the sounds, emotions, and, in certain settings, videos of the events throughout the call (Pierce, & Lilly, 2012). The intense emotional stress that all first responders face may lead to adverse mental health issues, including depression, anxiety, post-traumatic stress, sleep disturbance, and suicidal behaviors (Bentley et al., 2013; CDC, n.d.c; Lilly & Pierce, 2013; Pierce & Lilly, 2012; Vargas de Barros, Martins, Saitz, & Ronzani, 2013; Violanti et al., 2016).

This analysis used the NVDRS data from 2015-2017 to characterize suicides among first responders. The analysis found that first responders made up 1% of total suicides for this period. Over half (58%) of the first responder deaths by suicide involved LEOs; however, LEOs only accounted for about 40% of the first responder workforce in the United States in 2018 (U.S. BLS, 2019). Compared to non-first responders, a larger portion of first responder decedents were male, married, and served in the military. Some common risk factors for suicide (history of suicidal thoughts, previous suicide attempt, alcohol/substance abuse problem) were significantly lower among first responders.

This analysis also found that first responder decedents had a higher proportion of job, intimate partner, and physical health problems (CDC, 2021) reported by family and/or friends of first responders than reported for non-first responders. Prior research has documented job-related stressors and explored the strain they place on the significant others of first responders. A qualitative study found spouses of paramedics reported their relationships were impacted by job-related stressors that their significant others experienced, including shift work and work-related stress and trauma (Regehr, 2005). The spouses also

reported seeing personality changes (e.g., becoming less empathetic) in their significant others (Regehr, 2005). Research has shown that LEOs whose agencies had family-friendly administrative policies and programs such as marital support groups, family orientation programs, 24-hour childcare, and family crisis telephone services were more likely to report lower levels of work-family conflict (Youngcourt & Huffman, 2005). More research is needed to understand job, intimate partner, and physical health problems in relation to suicides among first responders.

This study also found that 23% of the first responders who died by suicide were military veterans, compared to 11% of non-first responders. This finding parallels existing research on the presence of veterans in the workforce. For example, a 2014 study found that approximately 6% of the U.S. population had served in the military, but 19% of police officers had previously served (Lewis & Pathak, 2014). Law enforcement is a common career trajectory for military veterans. In fact, law enforcement is the third most common occupation choice among veterans behind truck driving and management (Weichselbaum & Schwartzapfel, 2017). Additional research is needed to examine the relationship between suicide and military service to understand and inform suicide risk among first responders with military service.

This study also found that the percentage of suicides involving firearms among first responders was significantly higher than among non-first responders. Furthermore, similar to prior studies, a majority of the suicides among LEOs were by firearm (79%) (Violanti, Mnatsakanova, Hartley, Andrew, & Burchfiel, 2012). A RAND literature review (2018) concluded that gun availability was associated with an increased risk of suicide. Research has shown that not storing guns safely can also be a suicide risk factor (RAND, 2018). Using region-specific data, a 2001 study found that the majority of LEO surveyed did not practice safe firearm storage (e.g., unlocked, loaded) (Coyne-Beasley, Johnson, Charles, & Schoenbach, 2001). Additional research on current LEO attitudes and practices about safe firearm storage may provide insights that could inform interventions to limit gun accessibility.

Our data indicated LEO decedents had slightly lower percentages of depressed mood, mental health problems, history of suicidal thoughts, and history of suicide attempts compared to FFs and EMS clinicians. These findings suggest potentially relevant questions to explore. For example, how can first responders at risk for suicide be assisted when it appears that some of the leading risk factors (mental health problems, history of suicidal thoughts, previous suicide attempt, alcohol/substance abuse problems) are not present or apparent?

Because of the small number of suicides among public safety telecommunicators identified in this study, the authors were unable to conduct a detailed analysis of this worker group. Previous research, however, has shown that these first responders can face unique secondary traumatic stressors (Adams, Shakespeare-Finch, & Armstrong, 2015; Coxon et al., 2016; Pierce & Lilly, 2012; Shakespeare-Finch, Rees, & Armstrong, 2015). In a qualitative study of Australian public safety telecommunicators, Adams et al. (2015) identified three job-related themes that emerged from participant interviews: occupational stress and vicarious

trauma, organizational stress, and posttraumatic growth (positive changes after experiencing trauma). Subthemes included lack of recognition of their role as first responders, frequent exposure to complex and stressful calls, spillover of occupational stress to their personal lives, and the use of cognitive strategies, such as constructing meaningful narratives through cognitive reappraisal, to cope with occupational stress (Adams et al., 2015). Public safety telecommunicators routinely communicate with people experiencing trauma and experience verbal abuse and poor treatment from callers and even other first responders (Coxon et al., 2016; Tracy & Tracy, 1998). A 2015 study found 17.6–24.6% of public safety communicators had current probable PTSD, based on self-reported symptoms (Lilly & Allen, 2015). According to Coxon et al. (2016), these first responders often do not have access to the same training and support that other types of first responders, such as EMS clinicians, receive through their agencies. Future research exploring suicides among telecommunicators may help uncover potential secondary stressor and the possible impact they have on the health of telecommunicators.

Estimates of suicides, suicide risk and protective factors, and even the numbers and categories of first responders are dependent upon completeness and quality of the information that is collected through NVDRS (Powell et al., 2006). To ensure that information on suicides among first responders is as complete as possible, the U.S. Congress approved funding for the Helping Emergency Responders Overcome (HERO) Act (2021). This legislation directed the CDC to create a Public Safety Officer Suicide Reporting Module as part of the National Violent Death Reporting System to increase knowledge of these events. The module builds upon elements currently collected through the NVDRS and includes information specific to the first responder community. These data are expected to provide opportunities to better understand suicide deaths among first responders and the circumstances surrounding those deaths. In 2020, the Federal Bureau of Investigation (FBI) was also directed to establish a new data collection system of suicide attempts and suicide deaths among current and former LEOs and public safety telecommunicators (FBI, n.d.; Law Enforcement Suicide Data Collection Act, 2020). In January 2022, an online portal opened for data submissions by law enforcement agencies; the first Law Enforcement Suicide Data Collection report on these data was expected to be published in mid-2022 (FBI, n.d.). The U.S. Fire Administration has collected data on on-duty deaths since 1976; however, suicides that occur outside of occupational duties are just starting to be captured (US FA, 2021). Additional data collection, including more detailed information about circumstances of each death, could help quantify the problem and may be useful to inform prevention efforts.

A promising resource for first responders is peer support programs. Peer support programs are not new as these programs have been used for returning veterans since the early 2000s and have been associated with positive mental health outcomes (Greden, et al., 2010; Weir, Cunningham, Abraham, & Allanson-Oddy, 2019). While these programs are relatively new in many first responder organizations and there are few scientific evaluations of them, the current evidence supports these programs. Peer support programs were implemented in three northern Colorado law enforcement agencies and 90% of officers reported they would seek help through a peer again, if needed (Digliani, 2018). An evaluation of a peer support

program in Ontario's police services found that the program significantly contributed to the reduction of stigma associated with seeking mental health support (Milliard, 2020).

5. Limitations

This study is subject to several limitations. The first limitation is the fact that the data used in this study do not imply causality. The second limitation is related to the comparison group of non-first responders. While this study tested the significance of the differences between the two groups, the ability to draw inferences from the comparison between first responders and non-first responders is limited due to the breadth of the non-first responder group. The size of both the first responder and non-first responder groups likely impacted the outcomes of the comparisons. By restricting eligible NVDRS cases to individuals aged 16–64 years, first responders older than 64 who continued to serve may have been missed. Third, there were fewer decedents aged 16–24 years old among first responders (6%) than non-first responders (15%). This structural difference in age distribution between the two groups may reflect an underlying difference in the age distribution of all first responder and non-first responders (not just decedents) given the job training requirements, particularly for first responders. These requirements may in fact reduce the representation of the youngest age group among first responders and artificially impact the statistical differences between the two groups. Fourth, because the NVDRS was not yet national at the time of analysis, these results are also not necessarily generalizable to the entire population of first responders in the United States. Fifth, first responder and non-first responder categories were created based on available occupational information. Given that about a quarter of cases had non-specific occupations and about 10% of the data had missing or unknown occupation information, this may have impacted appropriate categorization of available cases. Sixth, the industry and occupation data obtained from death certificates or death scene investigations reflect "usual" or "lifetime" industry and occupation, only account for one job, and rely on the accuracy and completeness of employment information provided by decedents' employers or family members. Thus, those who served in multiple or volunteer first responder roles or who were retired from first responder jobs may not have been captured as such. This may impact these results, as first responders are known to work for multiple agencies at once and/or work across multiple first responder roles (e.g., LEOs who volunteer as EMS clinicians; FFs who are also EMS clinicians) (Loo, 1986; Vigil et al., 2019). The authors were unable to glean information regarding these cross-trained first responders. In addition, there may be stigma and other reasons that hamper any death (regardless of whether the decedent was a first responder or not) from being reported as suicides (e.g., insurance payouts) (CDC, 1988; Loo, 1986). For all suicides, miscoding of variables such as manner of death or usual occupation used to identify cases may have also impacted results. The information on the decedent, including their medical and mental health status is not always captured from medical records and may/may not be found in C/ME records or reported by decedents' employers, friends, or family members. Thus, the completeness and accuracy of this information is dependent on informants' knowledge and willingness to disclose (Wilson et al., 2022). Together, these factors can lead to an underestimate of suicides and limit the generalizability of the data. Finally, while the authors attempted to control for the testing of multiple hypotheses by using the conservative

Bonferroni procedure, it must be noted that the possibility of making a type 1 error remains (Rosenthal & Rubin, 1983).

6. Conclusions

Although the NVDRS is the largest database of violent death, including suicides, this is the first study to use the NVDRS to study suicides among all first responders. While this analysis of NVDRS data is a small glimpse into first responder suicides, the study found many common risk factors for suicides among the general population (i.e., history of suicidal thoughts and previous suicide attempt) were reported somewhat less frequently among first responders. However, first responder decedents had a higher proportion of job, intimate partner, and physical health problems. When comparing across types of first responders, the authors found similarities (e.g., firearms were the leading method of injury across all groups), as well as important differences, such as lower percentages of depressed mood, mental health problems, history of suicidal thoughts, and history of suicide attempts among LEOs compared to FFs and EMS clinicians.

Although the NVDRS includes information about mental health issues, the information in the NVDRS on the circumstances preceding suicide (e.g., occupational or personal stressors at time of death) depend on the completeness and quality of the reports that the information is drawn from Powell et al., 2006. This study has identified areas where additional research is needed to better understand occupational and personal stressors and their relation to suicide and suicidal behaviors among first responders to facilitate suicide prevention efforts. The expanded data collected through the NVDRS module for first responders may provide needed details to better understand these relationships. Additionally, it would be beneficial to expand research by identifying and examining other data sources to better understand what contributes to suicides within each first responder subpopulation to better direct evidenced based interventions for these critical workforces.

Biographies

Leslie Carson, MPH, MSW: At the time this work was conducted, Leslie was a Highway Safety Specialist in the Impaired Driving Division of the National Highway Traffic Safety Administration (NHTSA) in Washington, DC. Her interest in occupational safety and the first responder community was sparked while she was a Public Health Fellow at NHTSA’s Office of Emergency Medical Services (EMS), where she explored the behavioral health needs of EMS clinicians and public safety telecommunicators. Leslie served as a member of the Prehospital/EMS team of the Healthcare Resilience Working Group (a federal COVID-19 response initiative), for which she led the creation of several first responder behavioral health resources. Leslie has worked in health in higher education, local government, and federal settings. Her research interests include behavioral health and harm reduction among first responders and the maternal and child health population.

Suzanne Marsh, MPA, is a research statistician and team lead at the U.S. National Institute for Occupational Safety and Health. Suzanne has published extensively in the field of occupational injuries and has worked with various occupations including firefighters,

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Table 1

Jurisdictional Data included in the National Violent Death Reporting System (NVDRS), 2015–2017.

Jurisdiction	2015	2016	2017
Alabama			
Alaska	X[a]	X	X
Arizona	X	X	X
Arkansas			
California			X[b]
Colorado	X	X	X
Connecticut	X	X	X
Delaware			X
District of Columbia			X
Florida			
Georgia	X	X	X
Hawaii	X	X	*c*
Idaho			
Illinois		X[d]	X[d]
Indiana		X	X
Iowa		X	X
Kansas	X	X	X
Kentucky	X	X	X
Louisiana			
Maine	X	X	X
Maryland	X	X	X
Massachusetts	X	X	X
Michigan	X	X	X
Minnesota	X	X	X
Mississippi			
Missouri			
Montana			
Nebraska			
Nevada			X
New Hampshire	X	X	X
New Jersey	X	X	X
New Mexico	X	X	X
New York	X	X	X
North Carolina	X	X	X
North Dakota			
Ohio	X	X	X
Oklahoma	X	X	X
Oregon	X	X	X

Jurisdiction	2015	2016	2017
Pennsylvania		X[d]	X[d]
Puerto Rico			X
Rhode Island	X	X	X
South Carolina	X	X	X
South Dakota			
Tennessee			
Texas			
Utah	X	X	X
Vermont	X	X	X
Virginia	X	X	X
Washington		X[d]	X[d]
West Virginia			X
Wisconsin	X	X	X
Wyoming			
Total Jurisdictions	**27**	**32**	**37**

[a] X indicates data were provided by a particular state or jurisdiction. No X indicates data were not provided.

[b] Collected data for violent deaths that occurred in 4 counties (Los Angeles, Sacramento, Shasta, and Siskiyou) (n = 1,866; representing 27.8% of violent deaths that occurred in California in 2017), in accordance with requirements under which the state was funded.

[c] Excluded from data years 2017 due to incomplete case reporting.

[d] Collected data on > 80% of violent deaths in state, in accordance with requirements under which the state was funded.

Table 2

Number and percentage [a] of suicides among first responders[b] compared to non-first responders[b] by selected sociodemographics - National Violent Death Reporting System,[c] 2015–2017.

	First Responder Suicides No. (%)	Non-Responder Suicides No. (%)	*p*-value
Total	**676**	**60,903**	
First Responder Type			
Law Enforcement	393 (58%)	N/A	N/A
Firefighters	144 (21%)	N/A	N/A
EMS	124(18%)	N/A	N/A
Public Safety Telecommunicators	15 (2%)	N/A	N/A
Sex			
Male	594 (88%)	46,447 (76%)	**p < 0.0001** [d]
Female	82 (12%)	14,455 (24%)	**p < 0.0001**
Age Group (years)			
16–24	38 (6%)	9,422 (15%)	**p < 0.0001**
25–34	133 (20%)	12,400 (20%)	p = 0.656
35–44	160 (24%)	11,739 (19%)	p = 0.008
45–54	190 (28%)	14,388 (24%)	p = 0.01
55–64	155 (23%)	12,954 (21%)	p = 0.307
Race/Ethnicity			
White, non-Hispanic	563 (83%)	49,020 (80%)	p = 0.053
Black, non-Hispanic	35 (5%)	4,094 (7%)	p = 0.072
Hispanic [e]	43 (6%)	4,331 (7%)	p = 0.427
Other	35 (5%)	3,458 (6%)	N/A
Marital Status			
Married/Civil Union/Domestic Partnership	318 (47%)	17,212 (28%)	**p < 0.0001**
Never Married	165 (24%)	25,396 (42%)	**p < 0.0001**
Divorced	137 (20%)	12,906 (21%)	p = 0.552
Married/Civil Union/Domestic Partnership but Separated	30 (4%)	2,172 (4%)	p = 0.273
Single or widowed	23 (3%)	2,637 (4%)	p = 0.187
Education			

	First Responder Suicides No. (%)	Non-Responder Suicides No. (%)	*p*-value
High school or GED	181 (27%)	24,656 (40%)	**p < 0.0001**
Some college, no degree	183 (27%)	10,723 (18%)	**p < 0.0001**
Associate's	135 (20%)	4,792 (8%)	**p < 0.0001**
Bachelor's	119 (18%)	7,224 (12%)	**p < 0.0001**
Master's or higher	27 (4%)	3,192 (5%)	p = 0.100
Other/unknown	31 (5%)	10,316 (17%)	N/A
Military			
Ever Served in Military	153 (23%)	6,623 (11%)	**p < 0.0001**
Primary Mechanism			
Firearm	469 (69%)	27,035 (44%)	**p < 0.0001**
Hanging, strangulation	123 (18%)	19,520 (32%)	**p < 0.0001**
Poisoning [f]	57 (8%)	8,979 (15%)	**p < 0.0001**
Other, unknown [g]	27 (4%)	5,369 (9%)	N/A

[a] Percentages might not total 100% due to rounding.

[b] First responders included: emergency medical technicians and paramedics (i.e., EMS clinicians) (SOC code 29-2041), LEOs (SOC codes 33-1012 and 33-3051), FFs (SOC codes 33-1020, 33-1021, 33-2010, and 33-2011), and public safety telecommunicators (SOC code 43-5031). First responders included anyone in paid, unpaid, and/or volunteer capacities. All other occupations were combined into a non-first responder category.

[c] All 50 U.S. states, the District of Columbia and Puerto Rico are currently funded to participate in NVDRS, but at the time of this study several of the more recently funded states had not yet completed a data collection cycle and therefore were not included in this analysis. States and jurisdictions were first funded to participate in NVDRS in different years. Data for this study comes from the following states/jurisdictions: 2015–2017: Alaska, Arizona, Colorado, Connecticut, Georgia, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin; 2015–2016: Hawaii; 2016–2017: Illinois, Indiana, Iowa, Pennsylvania, and Washington; and 2017: California, Delaware, District of Columbia, Nevada, Puerto Rico, and West Virginia. Data from Hawaii for 2017 were excluded due to incomplete case counting. Illinois, Pennsylvania, and Washington collected data on ≥ 80% of violent deaths in their state, in accordance with requirements under which these states were funded. Data for California are for violent deaths that occurred in four counties (Los Angeles, Sacramento, Shasta, and Siskiyou).

[d] Bold numbers indicate significance for the Bonferroni adjustment (p = 0.0021).

[e] Includes persons of any race.

[f] Poisoning involves any substance including drugs that were ingested that led to the death of the victim or carbon monoxide poisoning not due to fire.

[g] Other and unknown weapons include sharp or blunt instrument, fall, explosion, drowning, fire (including carbon monoxide poisoning due to a fire), motor vehicle incident including a crash or a pedestrian being struck by a motor vehicle, or intentional neglect (starving oneself, e.g.), and other unspecified weapons.

Table 3

Number and percentage[a] of suicides among first responders[b] compared to non-first responders[b] by select factors where circumstances were known – National Violent Death Reporting System,[c] 2015–2017.

	First Responder Suicides (%)	Non-responder Suicides (%)	*p*-value
Total	623	55,785	N/A
Current (Perceived) Depressed Mood	222 (36%)	20,171 (36%)	p = 0.786
History of Mental Health/Substance Use Treatment	208 (33%)	21,414 (38%)	p = 0.010
Current Mental Health Problem	285 (46%)	28,689 (51%)	p = 0.005
Current Mental Health/Substance Use Treatment	153 (25%)	15,872 (28%)	p = 0.030
History of Suicide Attempt	85 (14%)	12,389 (22%)	**p < 0.0001** [d]
History of Suicidal Thoughts	164 (26%)	18,722 (34%)	**p < 0.0001**
Alcohol Use Suspected (at death)	152 (24%)	12,392 (22%)	p = 0.197
Alcohol Problem	90 (14%)	11,346 (20%)	**p = 0.0002**
Other Substance Abuse (non-alcohol)	52 (8%)	11,334 (20%)	**p < 0.0001**
Recent Criminal or Legal Problems Appeared to Contribute to Death	51 (8%)	5,411 (10%)	p = 0.193
Financial Problem Appeared to Contribute to Death	51 (8%)	5,296 (9%)	p = 0.258
Intimate Partner Problem (Current or Former) Appeared to Contribute to Death	278 (45%)	17,534 (31%)	**p < 0.0001**
Job Problem Appeared to Contribute to Death	108 (17%)	6,498 (12%)	**p = 0.0001**
Physical Health Problem Appeared to Contribute to Death	124 (20%)	8,436 (15%)	**p = 0.001**

[a] Percentages do not total 100%. Categories are not mutually exclusive.

[b] First responders included: emergency medical technicians and paramedics (i.e., EMS clinicians) (SOC code 29-2041), LEOs (SOC codes 33-1012 and 33-3051), FFs (SOC codes 33-1020, 33-1021, 33-2010, and 33-2011), and public safety telecommunicators (SOC code 43-5031). First responders included anyone in paid, unpaid, and/or volunteer capacities. All other occupations were combined into a non-first responder category.

[c] All 50 U.S. states, the District of Columbia and Puerto Rico are currently funded to participate in NVDRS, but at the time of this study several of the more recently funded states had not yet completed a data collection cycle and therefore were not included in this analysis. States and jurisdictions were first funded to participate in NVDRS in different years. Data for this study comes from the following states/jurisdictions: 2015–2017: Alaska, Arizona, Colorado, Connecticut, Georgia, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin; 2015–2016: Hawaii; 2016–2017: Illinois, Indiana, Iowa, Pennsylvania, and Washington; and 2017: California, Delaware, District of Columbia, Nevada, Puerto Rico, and West Virginia. Data from Hawaii for 2017 were excluded due to incomplete case counting. Illinois, Pennsylvania, and Washington collected data on ≥ 80% of violent deaths in their state, in accordance with requirements under which these states were funded. Data for California are for violent deaths that occurred in four counties (Los Angeles, Sacramento, Shasta, and Siskiyou).

[d] Bold numbers indicate significance for the Bonferroni adjustment (p = 0.0036).

Table 4

Number and percentage[a] of suicides among first responders[b] by selected sociodemographics and occupation – National Violent Death Reporting System,[c] 2015–2017.

	Law Enforcement Suicides (%)	Firefighter Suicides (%)	EMS Suicides (%)	Total Suicides
Total	**393 (58%)**	**144 (21%)**	**124 (18%)**	**676** [d]
Sex				
Male	351 (89%) [e]	137 (95%)	96 (77%)	594 (88%) [f]
Female	42 (11%)	7 (5%)	28 (23%)	82 (12%)
Age Group				
20–24	12 (3%)	11 (8%)	11 (9%)	35 (5%)
25–34	65 (17%)	31 (22%)	32 (26%)	133 (20%)
35–44	90 (13%)	37 (5%)	30 (4%)	160 (24%)
45–54	134 (34%)	26 (18%)	27 (22%)	190 (28%)
55–64	92 (23%)	37 (26%)	23 (19%)	155 (23)
Race/Ethnicity				
White, non-Hispanic	333 (85%)	104 (72%)	111 (90%)	563 (83%)
Black, non-Hispanic	23 (6%)	9 (6%)	_[g]	35 (5%)
Hispanic [h]	27 (7%)	10 (7%)	6 (5%)	43 (6%)
Other	10 (3%)	21 (15%)	–	35 (5%)
Marital Status				
Married/Civil Union/Domestic Partnership	214 (54%)	57 (40%)	43 (35%)	318 (47%)
Never Married	68 (17%)	43 (30%)	47 (38%)	165 (24%)
Divorced	75 (19%)	33 (23%)	27 (22%)	137 (20%)
Married/Civil Union/ Domestic Partnership but Separated	21 (5%)	5 (3%)	–	30 (4%)
Single or widowed	13 (3%)	5 (3%)	–	23 (3%)
Military				
Ever Served in Military	101 (26%)	27 (19%)	22 (18%)	153 (23%)
Primary Mechanism				
Firearm	312 (79%)	82 (58%)	66 (53%)	469 (70%)
Hanging, strangulation	51 (13%)	39 (27%)	30 (24%)	123 (18%)

	Law Enforcement Suicides (%)	Firefighter Suicides (%)	EMS Suicides (%)	Total Suicides
Poisoning [i]	26 (7%)	10 (7%)	19 (15%)	57 (8%)

[a] Percentages might not total 100% due to rounding.

[b] First responders included: emergency medical technicians and paramedics (i.e., EMS clinicians) (SOC code 29-2041), LEOs (SOC codes 33-1012 and 33-3051), FFs (SOC codes 33-1020, 33-1021, 33-2010, and 33-2011), and public safety telecommunicators (SOC code 43-5031). First responders included anyone in paid, unpaid, and/or volunteer capacities.

[c] All 50 U.S. states, the District of Columbia and Puerto Rico are currently funded to participate in NVDRS, but at the time of this study several of the more recently funded states had not yet completed a data collection cycle and therefore were not included in this analysis. States and jurisdictions were first funded to participate in NVDRS in different years. Data for this study comes from the following states/jurisdictions: 2015–2017: Alaska, Arizona, Colorado, Connecticut, Georgia, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin; 2015–2016: Hawaii; 2016–2017: Illinois, Indiana, Iowa, Pennsylvania, and Washington; and 2017: California, Delaware, District of Columbia, Nevada, Puerto Rico, and West Virginia. Data from Hawaii for 2017 were excluded due to incomplete case counting. Illinois, Pennsylvania, and Washington collected data on ≥ 80% of violent deaths in their state, in accordance with requirements under which these states were funded. Data for California are for violent deaths that occurred in four counties (Los Angeles, Sacramento, Shasta, and Siskiyou).

[d] Total includes 15 first responders that were public safety telecommunicators.

[e] Percentages by occupation group represent percentages of the total in each occupation group.

[f] Percentages represent percentages of the total (676).

[g] Data do not meet reporting requirements.

[h] Includes persons of any race.

[i] Poisoning involves any substance including drugs that were ingested that led to the death of the victim or carbon monoxide poisoning not due to fire.

Table 5

Number and percentage[a] of suicides among first responders[b] by select factors and occupation where circumstances were known – National Violent Death Reporting System,[c] 2015–2017.

	Law Enforcement Suicides (%)	Firefighter Suicides (%)	EMS Suicides (%)	Total Suicides
Total	**362 (58%)**	**133 (21%)**	**114 (18%)**	**623** [d]
Current (Perceived) Depressed Mood	119 (33%)[e]	48 (36%)	50 (44%)	222 (36%) [f]
Current Mental Health Problem	145 (40%)	62 (47%)	71 (62%)	285 (42%)
History of Mental Health/Substance Use Treatment	101 (28%)	48 (36%)	53 (46%)	208 (31%)
Current Mental Health/Substance Use Treatment	80 (22%)	32 (24%)	37 (32%)	153 (25%)
History of Suicide Attempt	36 (10%)	23 (17%)	24 (21%)	85 (14%)
History of Suicidal Thoughts	86 (24%)	34 (26%)	37 (32%)	164 (24%)
Alcohol Use Suspected (at death)	95 (26%)	27 (20%)	29 (25%)	152 (24%)
Intimate Partner Problem (Current or Former) Appeared to Contribute to Death	162 (45%)	62 (47%)	48 (42%)	278 (41%)
Job Problem Appeared to Contribute to Death	76 (21%)	17 (13%)	14 (12%)	108 (16%)
Physical Health Problem Appeared to Contribute to Death	74 (20%)	22 (17%)	24 (21%)	124 (18%)

[a] Percentages do not total 100%. Categories are not mutually exclusive.

[b] First responders included: emergency medical technicians and paramedics (i.e., EMS clinicians) (SOC code 29-2041), LEOs (SOC codes 33-1012 and 33-3051), FFs (SOC codes 33-1020, 33-1021, 33-2010, and 33-2011), and public safety telecommunicators (SOC code 43-5031). First responders included anyone in paid, unpaid, and/or volunteer capacities.

[c] All 50 U.S. states, the District of Columbia and Puerto Rico are currently funded to participate in NVDRS, but at the time of this study several of the more recently funded states had not yet completed a data collection cycle and therefore were not included in this analysis. States and jurisdictions were first funded to participate in NVDRS in different years. Data for this study comes from the following states/jurisdictions: 2015–2017: Alaska, Arizona, Colorado, Connecticut, Georgia, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, and Wisconsin; 2015–2016: Hawaii; 2016–2017: Illinois, Indiana, Iowa, Pennsylvania, and Washington; and 2017: California, Delaware, District of Columbia, Nevada, Puerto Rico, and West Virginia. Data from Hawaii for 2017 were excluded due to incomplete case counting. Illinois, Pennsylvania, and Washington collected data on ≥ 80% of violent deaths in their state, in accordance with requirements under which these states were funded. Data for California are for violent deaths that occurred in four counties (Los Angeles, Sacramento, Shasta, and Siskiyou).

[d] Total includes 14 first responders that were public safety telecommunicators.

[e] Percentages by occupation group represent percentages of the total in each occupation group.

[f] Percentages represent percentages of the total (676).