# Mental Health Care Utilization and Psychiatric Diagnoses in a Sample of Military Suicide Decedents and Living Matched Controls

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## Abstract

This paper examined mental health care utilization and psychiatric diagnoses among United States (U.S.) military personnel who died by suicide. We employed an existing electronic health record dataset including 800 U.S. Military suicide decedents and 800 matched controls. Suicide decedents were more likely to have received outpatient and inpatient mental health care and to have been diagnosed with depression, bipolar, and nonaffective psychotic disorders. Younger decedents and those in the U.S. Marine Corps were less likely to receive MH care prior to suicide. Given that approximately half of the suicide decedents in our sample had no mental health care visits prior to their death, our study suggests the need for programs to increase treatment engagement by at-risk individuals. Such programs could address barriers to care such as stigma regarding mental illness and concerns that seeking mental health care would damage a service member's career.

## Keywords

Suicide; Military; Diagnoses; Service Utilization

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## Introduction

Suicide is now the leading cause of death among United States (US) military service members (Armed Forces Health Surveillance Center, 2014). Although the majority of individuals who die by suicide suffer from a mood or psychotic disorder at the time of their death, only a minority have received a formal diagnosis or treatment for these conditions (Cavanagh et al., 2003; Pruitt et al., 2018). United States service members (USSMs) are more likely to be exposed to certain suicide risk factors, e.g., strain on romantic relationships due to mandatory deployments, exposure to traumatic brain injuries, and ready access to firearms (Martin et al., 2009). Certain military occupations have also been associated with increased suicide rates, e.g., infantryman and combat engineer (Kessler et al., 2015). USSMs are also more likely to develop some mental health conditions that themselves increase risk for suicide, including major depressive disorder and sleep disorders (Hom et al., 2017).

USSMs differ from the general population in their access to and utilization of mental health (MH) care. Among USSMs who reported having a mental health problem in the past year, only 29% reported seeking or utilizing MH care to address that problem, which is significantly less than the 36% rate in the general US population. It is worth noting that the low utilization rate in the general US population is itself considered to be a major public health problem, with lack of sufficient health care coverage and high cost being cited as the most common barriers to receiving care (Walker et al., 2015). Thus, the low level of treatment utilization by USSMs is particularly noteworthy as USSMs generally have access to free or low-cost MH care services, and thus do not experience structural barriers to the same degree as members of the general US population (Hom et al., 2017). Some progress has been made in increasing MH care utilization among USSMs: initiatives such as those to engage US Army soldiers who screen positive for PTSD and depression have led to significant increases in certain forms of MH care utilization over time (Quartana et al., 2014).

An important barrier to MH care utilization by USSMs stems from their concern that seeking mental health care could negatively impact their career. USSMs report fearing differential treatment by their superiors, reduced confidence in their abilities, and reduced opportunities for career advancement if they seek MH care (Hom et al., 2017). Consistent with this, a study showed that service members were less willing to disclose suicidal ideation during a risk assessment protocol when informed that their responses could lead to referral to a behavioral health provider (Anestis and Green, 2015). Service members also report concerns that their mental health care treatment history would be reflected in their military service records or disclosed to their chain of command. It should be noted that these are not irrational concerns: Department of Defense (DoD) health care records are explicitly exempted from HIPAA regulations and DoD policy allows for the disclosure of behavioral health records for several reasons, including when a provider believes that a USSM's mental health condition poses a serious risk to specific military missions or would impair the performance of his or her assigned duties (Topinka and Caspari, 2014). Reporting mental health symptoms on required military screening forms can also trigger mandatory treatment and/or affect the USSM's assigned duties. For example, endorsing psychiatric symptoms during a pre-deployment health screening can result in mandatory treatment that disqualifies

the USSM from deployment for some time. Stigma about mental illness and help-seeking is another frequently self-reported barrier to care among USSM, however findings have been mixed regarding how much such stigma affects MH health care utilization behavior (Hom et al., 2017).

The current study sought to contribute to the existing literature examining MH care utilization and psychiatric diagnoses of USSMs who die by suicide. Our study employed a sample of 800 U.S. military personnel who died by suicide and 800 demographically matched living controls. Previous literature reviews have noted a deficit in research on factors such as branch of service, deployment history, and military rank in existing studies of military MH care utilization (Hom et al., 2017). We attempted to address these deficits in the literature by examining what effect these factors had on MH care utilization in USSM suicide decedents.

In the current study, we proposed the following hypotheses: (1) Suicide decedents would be more likely than matched controls to have at least one outpatient or inpatient mental health care visit and would attend a greater number of mental health care visits. (2) Suicide decedents who never had a mental health care visit prior to their death would be more likely to be male and younger than suicide decedents who did. This hypothesis was based on existing research showing that younger and male individuals are less likely than older and female individuals to seek mental health care prior to suicide (Luoma et al., 2002; McKibben et al., 2013). (3) In the subset of USSMs with at least one mental health visit, suicide decedents would be more likely to have been diagnosed with mood and nonaffective psychotic disorders than matched controls, consistent with previous studies showing that mood and psychotic disorders are particularly associated with suicidal behavior (Kessler et al., 1999; LeardMann et al., 2013). The presence of at least one mental health care visit was required as this was necessary for an individual to receive a mental health diagnosis in our dataset. (4) Suicide decedents would be more likely to have attended a MH care visit in the seven days prior to their death if they were diagnosed with a mood or nonaffective psychotic disorder. We were particularly interested in mental health care visits during the seven days prior to suicide as they suggest that the suicide decedent was in active treatment at the time of their death and that the individual was at acute short term risk for suicide at the time they last saw their mental health provider.

In our exploratory analyses, we examined: (1) Whether demographic factors (e.g., officer rank, military deployment) predicted utilization of mental health care among suicide decedents. (2) Whether a variety of psychiatric diagnoses were individually associated with suicide decedent status. (3) Whether multiple diagnoses collectively contributed to the prediction of suicide decedent status. (4) Whether a variety of diagnoses were individually associated with the likelihood of attending a mental health care visit in the seven days prior to suicide.

## Methods

### Sample and Procedures

The data used in this analysis were sourced from the Armed Forces Health Surveillance Center (AFHSC), a repository of more than 40 million serum samples with matched health care data of US military personnel (Lewis et al., 2011). Within this serum repository are samples from US military personnel who were officially declared to have died of suicide by the US military's Medical Mortality Registry after a detailed investigative review and confirmation by the Armed Forces Institute of Pathology. Samples from 800 randomly selected active duty US military personnel who died of suicide between 2002 and 2008 were selected for inclusion in the study. The official total of US activity duty military personnel suicide deaths during this period was 1,426 (DeBruyne, 2019), meaning that serum samples from more than half of all active duty USSM suicide deaths were included in this study. Eight-hundred living matched controls were also randomly selected from among the active duty US military personnel with samples in the AFHSC. Controls were matched to suicide decedents on the basis of age, gender, and rank. Age and gender where selected as matching variables because they were known to be associated with levels of circulating fatty acids, which was a focus of the original data collection efforts. Rank was included to serve as a proxy variable for socio-economic-status, which is also associated with differences in circulating fatty acids. Controls were also required to have had their serum sample drawn within 12 months of the serum draw of their matched decedent and were required to have an available DD 2796 Form, a post-deployment health survey form that is collected within 6 months of the completion of a deployment. Decedents were not required to have a DD 2679 form. Thus, 100% of controls had been deployed while 62% of decedents had been. In order to address the possibility that this difference in the deployment rate between the control and suicide decedent samples might bias our analyses, we re-ran all of the analyses described below while only including the 62% of suicide decedents who had been deployed: the pattern of findings in these deployed-only analyses were essentially unchanged from those using the whole suicide decedent sample, suggesting that this difference did not drive the results described below. Data from blood serum analyses and the DD 2679 form were not used in the current analysis.

The matched health care data that is stored along with the serum samples at the AFHSC includes information for all DoD provided health care that the individual received during their military service. ICD-9 discharge diagnosis codes were provided by the AFHSC for all available standardized inpatient and ambulatory/outpatient mental health care data reports. A mental health visit was operationalized as any health care visit that included an ICD-9 mental health code (ICD-9 290-219), regardless of the primary visit diagnosis. Visits including substance abuse codes (ICD-9 292, 303–305) were similarly counted as mental health visits. The mental health care data available for matched controls were censored on the date of the death of their matched decedent. Thus if a suicide decedent died on 1/1/2003, we filtered out any health care visit information for her/his matched control from 1/1/2003 onward. An initial listing of the frequency of all ICD-9 diagnoses was reviewed. Based on the initial review of diagnosis frequency, diagnoses for similar conditions were combined into summary categories (e.g., adjustment disorder with depressive features, dysthymic

disorder, and major depressive disorder into the summary category of "depression disorders"). Nonfatal suicide attempts were operationalized as the presence of E95 and E98 codes (Ursano et al., 2015). The individual ICD-9 code frequencies and the corresponding summary categories are listed in Supplement 1.

The institutional review board of The Uniformed Services University of the Health Sciences (FWA00001628; DOD assurance P60001) granted approval for this study's research protocol (HU873B-01). A waiver was granted to analyze already collected healthcare data and blood serum samples without seeking individual consent from each of the individuals whose data was used.

### Statistical Analyses

Logistic regressions and Student's *t* tests were used as appropriate for testing hypotheses and exploratory analysis. Detailed descriptions of the primary and exploratory analyses are reported in the results section below. All statistical analyses were conducted using SPSS 17.0. Statistical significance was operationalized as $\alpha = .05$.

## Results

### Mental Health Service Usage in Suicide Decedents and Matched Controls

Demographic information regarding the sample is shown in Table 1. To test our hypotheses that suicide decedents were more likely to receive outpatient and inpatient mental health care, we employed logistic regression. The individual logistic regressions tested whether suicide decedents were more likely have attended (a)　1 outpatient mental health visit and (b)　1 inpatient mental health visit. As hypothesized, the logistic regressions found that suicide decedents were more likely to have attended　1 outpatient MH visit [$\chi^2 (1) = 78.79$, $p < .001$, Nagelkerke $R^2 = .07$] and　1 inpatient MH visit [$\chi^2 (1) = 65.12$, $p < .001$, Nagelkerke $R^2 = .09$]. To test our hypothesis that decedents who received MH care would attend a greater number of MH visits than matched control, we employed a Student's *t*-test on the subset of decedents and controls who had　1 MH visits with decedent status as the independent variable and number of MH care visits as the dependent variable. Consistent with our hypothesis, this Student's *t*-test found that suicide decedents had a higher average number of mental health care visits than matched controls, $t = 4.57$, df = 593.1, $p < .001$ (equal variance not assumed). Results from these analyses are shown in Table 2.

Forty-eight percent of suicide decedents were found to have no documented MH care visits prior to their death. In order to test our hypothesis that male decedents were less likely to receive mental health care, we employed a logistic regression. In contrast to our hypothesis, male decedents were not significantly less likely to receive mental health care prior to their death than were female decedents [$\chi^2 (1) = 2.03$, $p = .154$, Nagelkerke $R^2 = .00$]. In order to test our hypothesis that younger decedents were less likely to receive mental health care, we employed a Student's *t*-test, with MH care usage vs. non-usage as the independent variable and age as the dependent variable. Consistent with our hypothesis, this *t*-test found that decedents who never received MH care services were younger at the time of their death, $t =$

4.97, df = 772, p < .001 (equal variance not assumed). Results from these analyses are shown in Table 3.

Exploratory analyses were undertaken to determine if other demographic factors predicted the likelihood of receiving MH care in decedents. Logistic regression was used to determine whether race/ethnicity, service branch (i.e., Army, Airforce, Marine Corps, and Navy), officer status, and history of    1 deployment were associated with receiving MH care prior to death. Multinomial categorical predictors (i.e., race and service) were dummy coded, with the largest category (white for race/ethnicity and Army for service branch) serving as the reference category. Service branch was found to significantly predict whether decedents received MH care prior to their death [$\chi^2$ (3) = 33.13, $p$ < .001, Nagelkerke $R^2$ = .05]. Marine Corps decedents were significantly less likely (OR = 0.42, 95% CI [0.27, 0.64], $p$ < .001) and Airforce decedents were significantly more likely (OR = 1.61, 95% CI [1.09, 2.37], $p$ < .001) than Army decedents to have received MH care prior to their death. Decedent's rank as an officer [$\chi^2$ (1) = .004, $p$ = .949, Nagelkerke $R^2$ = .00] and race [$\chi^2$ (6) = 3.49, $p$ = .745, Nagelkerke $R^2$ = .01] did not significantly predict MH care usage.

### Diagnoses in Suicide Decedents and Matched Controls

In order to test our hypotheses that suicide decedents would be more likely to be diagnosed with mood and non-affective psychotic disorders, we planned separate logistic regression analyses in the subsample of individuals with at least one MH care visit. The requirement of at least one MH visit was employed as those without MH visits received no diagnoses. Consistent with our hypotheses, our logistic regression analyses found that depression disorders [$\chi^2$ (1) = 21.40, $p$ < .001, Nagelkerke $R^2$ = .05] and bipolar disorders [$\chi^2$ (1) = 12.61, $p$ < .001, Nagelkerke $R^2$ = .03] were significantly more common among suicide decedents than matched controls. We could not employ logistic regression to test our hypothesis that nonaffective psychosis-spectrum disorders would be more common among decedents as all 15 individuals diagnosed with such disorders were suicide decedents. Instead, a Fisher's exact test was conducted, which found that nonaffective psychosis-spectrum disorders were indeed significantly more common in decedents as compared with matched controls ($p$ = .002). These results are summarized in Table 4.

In an exploratory analysis, we employed logistic regression and Fisher's exact tests to determine whether each individual diagnostic category significantly predicted decedent status. Logistic regression analyses found that adjustment disorders, family problems, interpersonal problems, personality disorder NOS, and unspecified mental disorder diagnoses were individually significantly predictive of suicide decedent status. Fisher's exact tests had to be employed with cluster B personality disorders, suicidal ideation, and history of suicide attempts as nearly all of the individuals with these diagnoses were decedents (18 of 18, 13 of 14, and 13 of 13 respectively). These Fisher's exact tests found that cluster B personality disorders, suicidal ideation, and history of suicide attempts significantly predicted increased likelihood of suicide decedent status.

Continuing our exploratory analysis, we sought to determine which combination of diagnoses would best predict suicide decedent status. To do so, we employed a step-forward conditional entry logistic regression. The list of independent variables evaluated by this

analysis included all of the diagnostic categories significantly associated with suicide in the independent logistic regressions (i.e., bipolar disorders, depression disorders, adjustment disorders, family problems, interpersonal conflict, personality disorder NOS, and unspecified mental disorders). The final model selected by the step-forward conditional entry logistic regression was significant, $\chi^2$ (4) = 45.2, $p < .001$, Nagelkerke $R^2$ = .10. The final model included four independent variables: depression disorders (OR 1.72, 95% CI [1.18, 2.51], p =.005), bipolar disorders (OR 8.31, 95% CI [1.09, 63.34], p =.041), adjustment disorders (OR 1.74, 95% CI [1.10, 2.77], p =.018), and unspecified mental disorders (OR 2.31, 95% CI [1.41, 4.39], p =.011). As a sensitivity test, a backward conditional entry analysis was conducted, which replicated the step-forward analysis by selecting the same four diagnoses in its final model.

### Diagnoses as Predictors of MH Care Utilization During the Seven Days Preceding Suicide

We hypothesized that, among suicide decedents with at least one MH visit, those diagnosed with a mood or psychotic disorder would be more likely to have attended a MH visit in the seven days prior to their death. We employed logistic regression to test this hypothesis. Consistent with our hypothesis, the logistic regression showed that both depression disorder [$\chi^2$ (1) = 20.62, $p < .001$, Nagelkerke $R^2$ = .09] and bipolar disorder [$\chi^2$ (1) = 8.19, $p$ = .004, Nagelkerke $R^2$ = .04] diagnoses significantly predicted that a decedent would have a MH visit in the seven days prior to their death. Inconsistent with our hypothesis, however, decedents with nonaffective psychosis spectrum disorder diagnoses were not more likely to have had a MH visit in the seven days prior to death [$\chi^2$ (1) = .089, $p$ = .765, Nagelkerke $R^2$ = .00]. The results of these analyses are shown in Table 5.

In our final exploratory analyses, we employed logistic regression to test whether decedents with other diagnoses were significantly more or less likely to have attended a MH care visit in the seven days prior to their suicide. As shown in Table 5, these logistic regressions found that individuals with adjustment disorders, anxiety disorders, family problems, insomnia disorders, PTSD, and unspecified mental disorders were more likely to have attended a MH visit in the seven days prior to their death.

## Discussion

### General Discussion

Consistent with our hypotheses, suicide decedents were more likely than matched controls to have attended at least one outpatient or inpatient mental health care visit prior to their death. Suicide decedents also attended a greater average number of mental health visits than matched controls. Younger decedents were less likely to attend a mental health care visit prior to their death. Contrary to our hypothesis, male sex did not decrease the likelihood that a suicide decedent would attend a mental health care visit prior to his death, though this result may have been due to a lack of statistical power given the small number of female suicide decedents (35 vs. 765 male decedents).

Our findings are consistent with previous studies showing that USSMs who go on to die by suicide are more likely to utilize mental health care services than other USSMs (Hyman et

al., 2012). Despite this, it is important to note that roughly half (48%) of the suicide decedents in our sample never attended a mental health care visit prior to their death. The Department of Defense Suicide Event Report (DoDSER) similarly found that only 49% of military suicide decedents had received a mental health diagnosis prior to their death (Pruitt et al., 2018), while another study that found that 49% of US Army Soldiers who self-reported considering or attempting suicide also reported using MH services (McKibben et al., 2014). The underutilization of MH care is unfortunate, as studies suggest that multiple forms of psychotherapy and pharmacological treatment are effective in protecting against suicidal behavior (Zalsman et al., 2016). Given that roughly half of all military suicide decedents do not appear to receive MH care prior to their death, suicide prevention efforts will likely benefit from (a) interventions delivered to individuals who are not engaged in mental health services, e.g., population level interventions such as means restriction (Lubin et al., 2010) or (b) programs to increase the likelihood that individuals at risk for suicide receive MH care services.

In exploratory analyses, we found that a greater proportion of US Air Force and a smaller proportion of US Marine Corps suicide decedents had engaged with mental health services prior to their death. The increased rate of mental health care utilization by US Air Force suicide decedents may reflect the comprehensive suicide prevention program that was implemented across the US Air Force at the time the study sample was collected (Knox et al., 2010).

Several MH care associated beliefs could be reasonable targets for interventions to improve MH care utilization by USSMs at risk for suicide. USSMs' beliefs that they cannot trust providers, that they will be prescribed unwanted medications, and that treatment is ineffective have all be shown to predict reduced service utilization (Hom et al., 2017). The converse has also been shown to be true, with positive attitudes towards help-seeking and mental health treatment predicting increased utilization over time (Adler et al., 2015). Efforts to alter these beliefs (e.g., testimonials, education regarding the efficacy of MH treatment) may help to increase MH service utilization. Educating service members that self-initiated and early treatment is associated with better mental health outcomes and with reduced impact on one's military career may also be an effective strategy (Rowan et al., 2014). Another potential invention would be to provide clear information to service members about the circumstances in which their information will be shared. As an example of this sort of clarification, DoD Instruction 6490.08 explicitly informed USSMs that mental health providers would not notify or disclose information to the USSM's commander unless one of several explicitly stated notification standards was met. Another strategy for increasing mental health care utilization would be to encourage family and friends to suggest that the USSM seek treatment, which has been shown to increase the likelihood of healthcare utilization (Zinzow et al., 2012). While several programs have been implemented to improve MH care utilization among USSMs, the effectiveness of these programs in altering MH care usage has rarely been measured, leading to a recent review recommending that future trials include careful assessment of pre- and post-intervention MH care utilization behavior (Hom et al., 2017).

The low prevalence in our sample of the ICD-9 code for suicidal ideation (13 suicide decedents and 1 matched control) almost certainly represents an underestimate of the true prevalence of suicidal ideation in our sample. In an anonymous survey of more than 10,000 active duty US Army Soldiers, 7% reported seriously considering or attempting suicide since joining the Army and 13% reported doing so during their lifetime, a rate which is more consistent with the estimated lifetime prevalence of suicidal ideation in the general population of between 6% and 14% (McKibben et al., 2014; Nock et al., 2008). One of the major causes of the under-charting of suicidal ideation in our dataset was likely the fact that the ICD-9 code for suicidal ideation (V62.84) was introduced in October 2005 (Ursano et al., 2015). Given that the suicide deaths recorded in our dataset occurred between 2002 and 2008 and that the use of the suicidal ideation ICD-9 code only gradually increased after it was created, the relatively late introduction of the ICD-9 code likely explains the low prevalence of suicidal ideation in our sample.

Consistent with our hypotheses, depression disorders, bipolar disorders, and nonaffective psychosis-spectrum disorders were more common among suicide decedents. This finding is consistent with prior research documenting the particular association of mood and psychotic disorders with suicidal behavior (Hyman et al., 2012). We also found that certain diagnoses were exclusive or nearly exclusive to the suicide decedent group, e.g., bipolar disorders (21 out of 22) and nonaffective psychosis-spectrum disorders (15 out of 15). The relative infrequency of these disorders and their strong association with suicide suggest that providing additional suicide prevention services (e.g., close monitoring, means restriction) to individuals with these disorders may be useful.

Both cluster B and unspecified personality disorder diagnoses were significantly more common in the suicide decedent group. This is consistent with existing research showing that personality disorders are more common among suicide decedents (Schneider et al., 2006). A combination of both personality and non-personality psychiatric disorders is associated with elevated risk for suicide beyond that explained by individual psychiatric diagnoses (Hawton et al., 2003). Mechanisms for this connection might include that individuals with comorbid personality disorders tend to have more severe symptoms, an earlier age at illness onset, and poorer treatment outcomes than individuals without comorbid personality disorders (George et al., 2003). Individuals with personality disorders may also be particularly vulnerable to engaging in suicidal behavior in response to stressful life events (Krysinska et al., 2006).

In our step-forward conditional entry logistic regression, the presence of depression disorder, bipolar disorder, adjustment disorder, and unspecified mental disorder all appeared to contribute independently to the prediction of suicide decedent status. Adjustment disorder has previously been associated with increased risk for suicide in military personnel (Bachynski et al., 2012). The incidence of adjustment disorders and "other mental health disorders" has increased in U.S. military personnel in recent years, even while the incidence of other disorders has remained flat or declined (Stahlman and Oetting, 2018), suggesting that future research might be needed to better understand the factors associated with adjustment and other mental health disorder diagnoses in the military context.

As hypothesized, suicide decedents with depression disorders (26%) and bipolar disorders (43%) were more likely to have seen a mental health provider in the seven days prior to their suicide than were suicide decedents who lacked either diagnosis (8%). Such individuals would likely benefit from current efforts to improve the short term prediction of suicidal behavior, a historically little studied topic (Glenn and Nock, 2014). Sleep disorders may also be a particularly useful focus for suicide prevention. We found that decedents with insomnia disorders were more likely to have seen a MH care provider in the 7 days prior to their death. This is consistent with a study of suicidal behavior in a US Military sample, which found that insomnia was predictive of both engagement with MH care and future suicidal behavior, whereas other suicide risk factors, such as hopelessness, were associated with decreased likelihood of engaging in MH care (Hom et al., 2016). Treatment of insomnia symptoms with cognitive behavioral therapy for insomnia (CBT-I) has been shown to reduce suicidal ideation in a study of US Veterans (Trockel et al., 2015). These findings suggest that proactive treatment of sleep disorders in USSMs, particularly those with other risk factors for suicide, might contribute to suicide prevention efforts.

Both interpersonal and family problems were more common among suicide decedents, while family problems additionally predicted an increased likelihood of being seen by a MH provider in the 7 days prior to suicide. These findings are consistent with previous research in military populations, which has shown that family and other interpersonal stressors increase risk for suicide and often immediately precede suicidal behavior (Logan et al., 2015; Pruitt et al., 2018). A previous study of US Army suicide decedents found that 42% had experienced the failure of a romantic or marital relationship in the three months prior to their suicide (Skopp et al., 2016), while another study found that 50% of US Air Force suicide decedents had had an interpersonal conflict in the 24-hours prior to suicide (Martin et al., 2013). This suggests that programs designed to improve family and interpersonal functioning and to assist USSMs who have recently experienced a relationship failure, particularly those with other known risk factors for suicidal behavior, may be helpful.

### Limitations

Our study employed electronic health records rather than direct interviews of U.S. military personnel. Thus, an important limitation of our study is that diagnoses could only be known in individuals who attended at least one mental health care visit and when their provider assessed and recorded a diagnosis. This affects several aspects of the interpretation of our results. First, we cannot know what the prevalence of diagnoses were in the individuals who never sought mental health services. For example, individuals with some disorders (e.g., mood disorders) might be more likely to seek help, while individuals with other disorders (e.g., personality disorders) might be less so. Secondly, being diagnosed with a psychiatric disorder can potentially have significant consequences for a USSM, up to and including medical discharge or early retirement (Ghahramanlou-Holloway et al., 2018). This fact may affect US Military psychiatric diagnostic practices in several ways: for instance, it might make some health care providers reluctant to employ certain diagnoses or make some military service members less willing to disclose their symptoms. Another limitation of our dataset is that the living controls were only matched on three demographic variables (i.e.,

age, gender, and rank) and were not matched on other demographic variables, such as race/ ethnicity, that may have been relevant.

## Conclusion

In a study of the medical records of 800 U.S. military suicide decedents and 800 matched controls, we found that suicide decedents were more likely to receive inpatient and outpatient mental health services, and to have attended a greater number of mental health appointments. We found that mood and psychotic disorders were more common among suicide decedents. We found that mood disorders were associated with an increased likelihood of MH provider contact in the 7 days prior to suicide. We found that younger individuals, as well as individuals in the U.S. Marine Corps, were less likely to receive MH care prior to suicide. Our findings suggests that suicide prevention in the armed forces may require both improved care of individuals already engaged in MH services, as well as outreach to at risk individuals who would not otherwise utilize MH services.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgements

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**Table 1 -**

Sample Demographics

| Variable | n | % | Mean (SD) |
|---|---|---|---|
| Participant type | | | |
|    Suicide Decedent | 800 | 50% | |
|    Matched Control | 800 | 50% | |
| Sex | | | |
|    Female | 70 | 4% | |
|    Male | 1,530 | 96% | |
| Race / Ethnicity | | | |
|    American Indian | 32 | 2% | |
|    Asian / Pacific Islander | 68 | 4% | |
|    Black | 221 | 14% | |
|    Hispanic | 170 | 11% | |
|    Other | 3 | 0% | |
|    White | 1061 | 66% | |
|    Unknown | 45 | 3% | |
| Service | | | |
|    Army | 742 | 46% | |
|    Airforce | 302 | 19% | |
|    Marine Corps | 279 | 17% | |
|    Navy | 277 | 17% | |
| Grade | | | |
|    Enlisted | 1,458 | 91% | |
|    Officer | 142 | 9% | |
| Deployments | | | |
|    0 | 305 | 19% | |
|    1 or more | 1,295 | 81% | |
| Outpatient MH Visits | | | |
|    0 | 1,003 | 63% | |
|    1 or more | 597 | 37% | |
| Inpatient MH Visits | | | |
|    0 | 1,457 | 91% | |
|    1 or more | 143 | 9% | |
| Age at Blood Draw | | | 26.6 (7.3) |

**Table 2 -**

Logistic Regressions and *t*-test Comparing Mental Health Care Use Between Suicide Decedents and Controls

| | Suicide % (n) | Control % (n) | OR [95% CI] | *P* |
|---|---|---|---|---|
| 1 Outpatient MH Visit | 47% (377) | 26% (207) | 2.55 [2.07, 3.15] | < .001 |
| 1 Inpatient MH Visit | 15% (116) | 3% (27) | 4.86 [3.15, 7.47] | < .001 |
| | **Suicide M (SD)** | **Controls M (SD)** | *t* **[DF]**[**] | *P*[**] |
| # of MH Visits [*] | 11.7 (19.4) | 6.2 (10.0) | 4.57 [593] | < .001 |

[*]
= Mean number of mental health visits among individuals with 1 or more mental health visits.

[**]
= Equal variances not assumed.

**Table 3 -**

Demographic Features Associated with Having One or More Mental Health Visits Among Suicide Decedents

| | % MH Visit | *n* MH Visit out of total | Chi Sq | DF | *P* |
|---|---|---|---|---|---|
| Sex | | | 2.02 | 1 | .155 |
|   Female | 60% | 21 of 35 | | | |
|   Male | 48% | 365 of 765 | | | |
| Race | | | 3.48 | 6 | .747 |
|   Asian / Pacific Islander | 46% | 16 of 35 | | | |
|   Black | 53% | 50 of 94 | | | |
|   Hispanic | 42% | 28 of 66 | | | |
|   American Indian | 50% | 11 of 22 | | | |
|   Other | 50% | 1 of 2 | | | |
|   White | 48% | 266 of 558 | | | |
|   Unknown | 61% | 14 of 23 | | | |
| **Service** [†] | | | **33.13** | **3** | **<.001** |
|   Army | 51% | 184 of 361 | | | |
|   **Airforce** | **63%** | **97 of 155** | | | |
|   **Marine Corps** | **30%** | **38 of 126** | | | |
|   Navy | 42% | 67 of 158 | | | |
| Grade | | | 0.00 | 1 | .949 |
|   Enlisted | 48% | 352 of 729 | | | |
|   Officer | 48% | 34 of 71 | | | |
| Deployments | | | 3.14 | 1 | .076 |
|   0 | 44% | 135 of 305 | | | |
|   1 or more | 51% | 251 of 495 | | | |
| | **Yes MH Visit M (SD)** | **No MH Visit M (SD)** | *t*[*] | df[*] | *P*[*] |
| **Age at Blood Draw** | **27.9 (7.6)** | **25.4 (6.8)** | **4.90** | **774** | **<.001** |

[†] = Army served as the reference category, Airforce and Marine Corp decedents significantly differed from Army decedents in their use of MH services.

[*] = Equal variance not assumed.

**Table 4 -**

Associations between Psychiatric Diagnoses and Suicide Among Individuals with One or More Mental Health Visits

| | % decedents out of total number of individuals with diagnosis | # of decedents out of total number of individuals with diagnosis | OR [95% CI] | P |
|---|---|---|---|---|
| >=1 MH Visits | 65% | 386 of 597 | NA | NA |
| Acute Stress Disorder | 68% | 25 of 37 | 1.15 [0.56, 2.34] | .702 |
| ADHD | 70% | 7 of 10 | 1.28 [0.33, 5] | .722 |
| **Adjustment Disorder** | **78%** | **107 of 138** | **2.23 [1.43, 3.46]** | **<.001** |
| Alcohol Use Disorder | 69% | 134 of 193 | 1.37 [0.95, 1.98] | .092 |
| Anxiety Disorders | 72% | 86 of 120 | 1.49 [0.96, 2.31] | .073 |
| **Bipolar Disorder** | **95%** | **21 of 22** | **12.08 [1.61, 90.47]** | **.015** |
| **Cluster B Personality D.** | **100%** | **18 of 18** | **NA***  | **.001*** |
| **Depression Disorder** | **75%** | **190 of 253** | **2.28 [1.6, 3.25]** | **<.001** |
| Drug Use Disorder | 75% | 36 of 48 | 1.71 [0.87, 3.35] | .122 |
| **Family Problems** | **81%** | **57 of 70** | **2.64 [1.41, 4.94]** | **.002** |
| Insomnia Disorder | 70% | 44 of 63 | 1.3 [0.74, 2.29] | .364 |
| **Interpersonal Problems** | **89%** | **17 of 19** | **4.81 [1.1, 21.04]** | **.037** |
| **Nonaffective Psychotic D.** | **100%** | **15 of 15** | **NA***  | **.002*** |
| Pain Disorder | 65% | 44 of 68 | 1 [0.59, 1.7] | .993 |
| **Personality Disorder NOS** | **81%** | **30 of 37** | **2.46 [1.06, 5.69]** | **.036** |
| PTSD | 66% | 40 of 61 | 1.05 [0.6, 1.83] | .874 |
| **Suicidal Ideation** | **93%** | **13 of 14** | **NA***  | **.024*** |
| **Suicide Attempt History** | **100%** | **13 of 13** | **NA***  | **.006*** |
| TBI | 75% | 15 of 20 | 1.67 [0.6, 4.65] | .33 |
| Tobacco Use Disorder | 64% | 134 of 209 | 0.96 [0.68, 1.37] | .839 |
| **Unspecified Mental D.** | **84%** | **70 of 83** | **3.37 [1.82, 6.26]** | **<.001** |

*
= Results are from a Fisher's exact test.

**Table 5 -**

Presence of a Mental Health Visit Within Seven Days of Suicide by Diagnosis Among Suicide Decedents with at Least 1 Mental Health Visit

| Diagnosis | % 7d MH Visit | n 7d MH Visit out of total decedents | OR [95% CI] | *P* |
|---|---|---|---|---|
| >=1 MH Visits | 17% | 66 of 386 | | |
| Acute Stress Disorder | 24% | 6 of 25 | 1.58 [0.61, 4.13] | .347 |
| ADHD | 14% | 1 of 7 | 0.81 [0.1, 6.8] | .842 |
| **Adjustment Disorder** | **23%** | **25 of 107** | **1.77 [1.01, 3.09]** | **.045** |
| Alcohol Use Disorders | 18% | 24 of 134 | 1.09 [0.63, 1.89] | .757 |
| **Anxiety Disorders** | **26%** | **22 of 86** | **2 [1.12, 3.57]** | **.019** |
| **Bipolar Disorders** | **43%** | **9 of 21** | **4.05 [1.63, 10.06]** | **.003** |
| Cluster B Personality D. | 22% | 4 of 18 | 1.53 [0.63, 3.73] | .348 |
| **Depression Disorders** | **26%** | **49 of 190** | **3.66 [2.02, 6.63]** | **<.001** |
| Drug Use Disorder | 28% | 10 of 36 | 2.02 [0.92, 4.42] | .079 |
| **Family Problems** | **28%** | **16 of 57** | **2.18 [1.14, 4.18]** | **.019** |
| **Insomnia Disorders** | **34%** | **15 of 44** | **2.95 [1.48, 5.89]** | **.002** |
| Interpersonal Problems | 18% | 3 of 17 | 1.04 [0.29, 3.73] | .951 |
| Nonaffective Psychotic D. | 20% | 3 of 15 | 1.22 [0.34, 4.46] | .761 |
| Pain Disorder | 23% | 10 of 44 | 1.5 [0.7, 3.22] | .295 |
| Personality Disorder NOS | 23% | 7 of 30 | 1.41 [0.45, 4.43] | .556 |
| **PTSD** | **35%** | **14 of 40** | **3.04 [1.49, 6.21]** | **.002** |
| Suicidal Ideation | 31% | 4 of 13 | 2.23 [0.67, 7.47] | .194 |
| Suicide Attempt History | 31% | 4 of 13 | 2.23 [0.67, 7.47] | .194 |
| TBI | 33% | 5 of 15 | 2.54 [0.84, 7.7] | .099 |
| Tobacco Use Disorder | 13% | 17 of 134 | 0.6 [0.33, 1.09] | .096 |
| **Unspecified Mental Disorder** | **30%** | **21 of 70** | **2.58 [1.42, 4.71]** | **.002** |