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Demographic and Occupational Risk Factors Associated with Suicide-Related Aeromedical
Evacuation Among Deployed US Military Service Members

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ABSTRACT

INTRODUCTION: Suicide is a significant problem in the U.S. military. Approximately 20 service members or veterans per day complete suicide, and veterans account for 16.5% of completed suicides in the United States, despite making up less than 10% of the adult population. Although there have been significant advances regarding suicide risk factors among U.S. military service members and veterans, there is little research about risk factors associated with suicide that could be potentially identified in theater. One salient study group consists of service members who receive a psychiatric aeromedical evacuation out of theater. The primary aims of this study were as follows: (1) determine the incidence of suicide-related aeromedical evacuation in deployed service members; (2) identify demographic and military characteristics associated with suicide-related aeromedical evacuation; and (3) examine the career impact of suicide-related aeromedical evacuation from a deployed setting.

MATERIALS AND METHODS: This was an archival analysis of U.S. Transportation Command Regulating and Command and Control Evacuation System and Defense Manpower Data Center electronic records of U.S. military service members (N = 7,023) who were deployed to Iraq or Afghanistan and received a psychiatric aeromedical evacuation out of theater between 2001 and 2013. Chi-square tests of independence and standardized residuals were used to identify cells with observed frequencies and proportions, respectively, that significantly differed from what would be expected by chance. Additionally, odds ratios were calculated to provide context about the nature of any significant relationships.

RESULTS: For every 1,000 psychiatric aeromedical evacuations that occurred between 2001 and 2013, 34.4 were suicide-related. Gender, ethnicity, branch of service, occupation classification, and deployment theater were associated with suicide-related aeromedical

evacuation (ORs = 1.37 to 3.02). Overall, 53% of all service members who received an aeromedical evacuation for any psychiatric condition had been separated from the military upon record review in 2015. Suicide-related aeromedical evacuation was associated with a 37% increased risk of military separation compared to evacuation for another psychiatric condition ($P < .02$).

CONCLUSIONS: Findings provide novel information on risk factors associated with suicide-related aeromedical evacuation as well as the career impact following a suicide-related aeromedical evacuation. When a suicide-related aeromedical evacuation triggers separation, this is costly for the military and potentially psychologically harming to the service member. Consequently, the military should focus on indicated prevention interventions for individuals who show sufficient early signs of crisis and functional problems so that specialized interventions can be used in theater to prevent evacuation. Indicated prevention interventions should start with leaders' awareness and mitigation of risk and, when feasible, evidence-based interventions for suicide risk provided by behavioral health (e.g., brief cognitive-behavior therapy for suicide). Future research should evaluate the feasibility, safety, and efficacy of delivering suicide-related interventions in theater.

Demographic and Occupational Risk Factors Associated with Suicide-Related Aeromedical Evacuation Among Deployed US Military Service Members

INTRODUCTION

Every 26 seconds, someone in the United States (U.S.) attempts suicide.¹ Suicide is the 10th leading cause of death in the U.S., where approximately 50,000 individuals die by suicide each year.² The average rate of suicide in the U.S. is 14.5 per 100,000, and this number has continued to increase in recent years.³ While the military has historically experienced lower suicide rates compared to the general U.S. population, research has found that suicide risk has become considerably greater among U.S. service members and veterans, with suicide rates nearly doubling in recent years.⁴⁻⁷ In fact, at the height of the troop drawdown from Afghanistan, suicide was identified as the second leading cause of death in the U.S. military.⁸

According to the Department of Defense Suicide Event Report, the recent prevalence of suicide across military branches has ranged from 19 to 36 per 100,000 service members, which is substantially higher than the U.S. general population.⁹ Approximately 20 service members or veterans per day complete suicide, and veterans account for 16.5% of completed suicides in the United States, despite making up less than 10% of the adult population.¹⁰ Given the rising incidence of suicide in the military and among veterans, it is imperative to identify risk factors for suicidality so that individuals can get preventative help before crises, despair, and hopelessness arise.

Research has identified a number of factors associated with suicide risk among military service members and veterans. For example, service members and veterans who die by suicide are more likely to be younger in age (17 to 24), Caucasian, junior enlisted, and male.¹¹⁻¹³ Not surprisingly, access to firearms is associated with increased risk of suicide in the military.¹⁴

Although men are proportionally at greater risk for death by suicide, women are more likely to attempt suicide and endorse suicidal ideation.¹⁵⁻¹⁶ Posttraumatic stress disorder, alcohol use disorder symptoms, depression, and history of suicidality have also been consistently identified as being associated with successful suicide among Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans.¹⁷ Unexpectedly, epidemiological studies have not shown an association between deployment-related factors (e.g., combat exposure, length of deployment, and number of deployments) and suicide deaths.^{13,18} This may be because suicidal ideation is one of the factors that may result in a service member being removed from a deployment roster if identified during the predeployment medical screening process. In contrast, one study of service members seeking health care at an Army medical center and screened for mental and behavioral health needs found that suicidal thoughts were associated with deployment variables.¹⁹

Although there have been significant advances regarding suicide risk factors among U.S. military service members and veterans, there is little research about risk factors associated with suicide that could be potentially identified in theater. One salient study group consists of service members who receive a psychiatric aeromedical evacuation out of theater. Previous research has reported that approximately 10% of service members aeromedically evacuated out of Iraq or Afghanistan were medically transported for psychiatric reasons.²⁰⁻²² Service members who received a psychiatric aeromedical evacuation were more likely to be female, enlisted, younger, and persons of color.²³⁻²⁶ Further, the decision to aeromedically evacuate a service member for psychiatric reasons also carries significant long-term consequences. Approximately 53% of individuals who received a psychiatric aeromedical evacuation were subsequently discharged from the military,²³ which may actually increase the long-term risk of a completed suicide.

Further evaluation on the incidence of factors associated with suicide-related psychiatric aeromedical evacuation will provide critical information to better inform mental health policy in the U.S. military.

This research was a follow-on study based on previous research that evaluated factors associated with psychiatric aeromedical evacuation.²³ The primary aims were as follows: (1) determine the incidence of suicide-related psychiatric aeromedical evacuation in U.S. service members deployed to Iraq or Afghanistan from 2001 to 2013; (2) examine the risk factors associated with suicide-related psychiatric aeromedical evacuation in order to better inform mental health policy designed to reduce risk for suicide in theater; and (3) evaluate the career impact of suicide-related aeromedical evacuation from a deployed setting.

METHODS

Study Design

This was a cross-sectional, observational study that included U.S. military service members (N = 7,023) who were deployed to Iraq or Afghanistan and received a psychiatric aeromedical evacuation out of theater between 2001 and 2013. Archival analyses were conducted using U.S. Transportation Command Regulating and Command and Control Evacuation System and Defense Manpower Data Center electronic records to evaluate demographic, clinical, and military attrition information (see baseline manuscript for a more complete description of study design and procedures).²³ All data were retrieved in 2015. The study was approved by the Institutional Review Boards at The University of Texas Health Science Center at San Antonio, 59th Medical Wing at Joint Base San Antonio-Lackland, and Wright-Patterson Air Force Base, Ohio.

Measures

Personal and Military Demographics

Personal demographics for military service members included categorical, self-report information on gender, age, race, ethnicity, marital status, and education level (see Table 1). Race and ethnicity were categorized as Caucasian, African American, Hispanic, Asian, and “Other Race.” Military characteristic demographics included service branch, military pay grade, occupation classification (combat arms, combat support, and combat service support), number of deployments, and combat theater (OEF and OIF). Demographic characteristic comparative analyses between this sample and the entire 2013 active duty military force were conducted to determine how this sample is proportionally related to the military population (see baseline manuscript).²³

Psychiatric Aeromedical Evacuation

Psychiatric aeromedical evacuation data included quarterly (every 3 months) reports on psychiatric aeromedical evacuation by year (2001-2013). Quarterly reports were partitioned as follows: Quarter 1 (Q1): January – March, Q2: April – June, Q3: July – September, Q4: October – December. Data points also had a primary psychiatric diagnosis that initiated the aeromedical evacuation based on the International Classification of Diseases, 9th revision (ICD-9). To enhance data interpretability, we partitioned suicidality into two coding categories of *suicide ideation* and *suicide attempt*. We also dismantled suicide attempt by method. Finally, we aggregated the two suicide categories into a *suicide-related* category.

Military Separation Characteristics

Data based on military separation were evaluated using the Interservice Separation Code (ISC). The ISC data collected provided an extensive list of reasons for military separation in this

sample. In order to meaningfully interpret the data, we first partitioned ISCs into two broad categories of *separated* versus *not separated*. Among service members who were coded as separated from the military, we further evaluated the nature of the military separation by dividing ISC codes into two additional categories of *voluntary* separation or *involuntary* separation

Statistical Analyses

Count and percentile statistics, or means and standard deviations as appropriate, were calculated to evaluate demographic, psychiatric aeromedical evacuation, and military separation characteristics for the total sample and for the suicide-related aeromedical evacuation category. Study aims were predominantly addressed using chi-square (χ^2) tests of independence. First, we assessed the frequency of suicide-related aeromedical evacuation in comparison to the total number of psychiatric aeromedical evacuations stratified by quarterly report. Suicidality data were dismantled to examine the rate of suicidal ideation and suicide attempt or method. Next, we compared demographic and military characteristic differences between service members with a *suicide-related* aeromedical evacuation versus *other psychiatric reason* for aeromedical evacuation. Lastly, we evaluated the relationship between suicide-related aeromedical evacuation and increased risk of military separation. Among separated service members, we also evaluated the nature of military separation (*voluntary* versus *involuntary*). Odds ratios (OR) were calculated to determine the nature of significant relationships. Further, standardized residuals (z) less than -1.96 and greater than 1.96 were used to identify cells with observed proportions significantly different from what would be expected by chance. All analyses were conducted using SPSS version 26.

RESULTS

Overall, 242 of the 7,023 (34.4 per 1,000) psychiatric aeromedical evacuations that occurred between 2001 and 2013 were due to a suicide-related diagnosis (see Figure 1 & Figure 2). The average annual rate of suicide-related evacuations was 4.1 per 100, with rates that ranged from 0.8 (2007) to 14.9 per 100 (2002). The highest incidence of suicide-related aeromedical evacuations occurred from 2012 to 2013 ($n = 107$). Approximately 44% of all suicide-related aeromedical evacuations occurred in this period. This increase in suicide-related aeromedical evacuations simultaneously coincided with a declining trend in the overall number of psychiatric aeromedical evacuations (see Figure 1). Additionally, 57% ($n = 137$) of psychiatric aeromedical evacuations during this timeframe had a primary evacuation code of suicide attempt, while the remaining 43% ($n = 105$) had a primary code of suicidal ideation. In terms of suicide attempt method, most service members (58%) received a nonspecified or other-specified diagnostic. The most common suicide attempt method beyond a nonspecified code was poisoning due to a controlled substance (35%). Interestingly, only six suicide attempts (< 5%) were coded as due to a firearm or handgun during the study period.

Demographic and Military Characteristics Risk Factors

Table 1 provides a detailed summary of personal demographic and military characteristics for the total sample, the suicide-related psychiatric aeromedical evacuations, and the aeromedical evacuation for other-psychiatric reason. Personal demographic results indicated that gender ($P < .001$) and race/ethnicity ($P = .01$) were associated with suicide-related aeromedical evacuation. More specifically, women were significantly overrepresented ($z = 5.0$) in the suicide-related aeromedical evacuation sample and were 106% more likely (OR = 2.06) to be in the suicide-related sample compared to men. Regarding race and ethnicity, African

American service members were overrepresented ($z = 3.0$) in the suicide-related aeromedical evacuation sample, whereas Caucasian service members were underrepresented ($z = -3.6$). Further, service members who identified as a person of color were 60% more likely to be in the suicide-related sample compared to Caucasian service members (OR = 1.60). More specifically, compared to Caucasian service members, there was an increased likelihood of being in the suicide-related sample of 75% for African American service members (OR = 1.75), 48% for Hispanics (OR = 1.48), 17% for Asians (OR = 1.17), and 61% for service members who were classified as “Other” race/ethnicity (OR = 1.61).

Results for military characteristics yielded that service branch ($P < .001$), occupation classification ($P < .006$), and deployment theater ($P < .001$) were associated with suicide-related aeromedical evacuation. Regarding service branch, Air Force service members were overrepresented ($z = 3.5$) in the suicide-related sample, while Marines were underrepresented ($z = -2.9$). Specifically, Air Force service members were 81% more likely to be in the suicide-related sample compared to Army, 105% compared to Navy, and 329% compared to Marines (OR = 1.81 to 4.29).

Results for military occupation classification indicated that combat arms were underrepresented in the suicide-related category ($z = -3.5$) and that combat service support (OR = 1.71) and combat support (OR = 1.80) were more likely to be in the suicide-related sample compared to combat arms. Results by theater suggested that OEF service members were overrepresented ($z = 6.8$) in the suicide-related sample and were 202% more likely to be in the suicide-related sample compared to OIF service members (OR = 3.02).

Career Impact and Military Separation

In total, 53% of all service members who received an aeromedical evacuation for any psychiatric reason from 2001-2013 had been separated from the military upon record review in 2015. Results indicated that 61% of those who received a suicide-related aeromedical evacuation had been separated from the military, a rate of 39 per 1,000 service members. Suicide-related evacuation was associated with a 37% increased likelihood (OR = 1.37) of separation from the military compared to evacuation for another psychiatric condition, $P < .02$. We explicated the nature of this relationship by partitioning separated service members into *voluntary* or *involuntary* separation groups. Overall, 74% of all service members who had been separated following a psychiatric aeromedical evacuation had been involuntarily separated. The rate of involuntary separation was only marginally greater (78%) among service members who received a suicide-related aeromedical evacuation ($P = .15$).

DISCUSSION

The primary aims of this study were to examine the incidence of suicide-related aeromedical evacuation, identify demographic and military characteristics associated with suicide-related aeromedical evacuation, and evaluate the career impact of suicide-related aeromedical evacuation from a deployed setting among U.S. military personnel. Between October 2001 and October 2013, 3.4% of psychiatric aeromedical evacuations out of a deployed location in Iraq or Afghanistan were suicide-related, a rate of 34.4 per 1,000. In comparison to service members who were aeromedically evacuated for another psychiatric reason, suicide-related evacuees were more likely to be female and a person of color. Additionally, suicide-related evacuees were more likely to be in the Air Force and to serve in a noncombat arms role in support of OEF.

Demographic results from this sample deviated from prior research that has demonstrated suicide risk was greater in Caucasian, male service members.¹²⁻¹³ Further, while prior research has found that younger age is related to increased risk of suicide among veterans seeking health care through U.S. Department of Veterans Affairs,¹¹ age was not associated with an increased risk of suicide-related aeromedical evacuation. Our findings suggested that service members serving in combat arms roles were less likely to be aeromedically evacuated for a suicide-related diagnosis compared to service members serving in noncombat arms roles. A possible explanation for this finding is that combat arms personnel receive extensive training for a combat environment prior to deployment (i.e., Survival Evasion Resistance Escape training), which may mitigate a debilitating psychological response. On the other hand, individuals serving in combat support or combat service support receive specialized training for their duty station, but their training may not be as extensive as for those serving in combat arms. It may also be the case that service members are required to serve in roles outside of their occupational specialty and training while in a deployed setting (i.e., patient administration at a combat theater hospital), which may also increase exposure to unanticipated trauma exposures for combat service support personnel. Contrary to prior research, we also found that suicide-related aeromedical evacuations were associated with service branch and deployment theater.¹³ In particular, U.S. Air Force personnel and those who deployed in support of OEF were found to be at increased risk of a suicide-related aeromedical evacuation.

The findings from this study provide novel information on the military career impact specifically associated with suicide-related aeromedical evacuation. To our knowledge, there is no published research on this topic, and this is the first study to investigate this area. Prior research has found that psychiatric aeromedical evacuation is related to a greatly increased risk

(almost four times greater likelihood) of military separation compared to the general military population.²³ In the current study, service members who received a suicide-related aeromedical evacuation were found to be at an even greater risk, with a 37% greater likelihood of military separation compared to those who received a psychiatric aeromedical evacuation for another reason. The data analysis indicated that the majority of service members (78%) were involuntarily separated, but the reason for a psychiatric aeromedical evacuation (suicide-related versus other) was not associated with an increased risk of involuntary separation. It is important to note that military separation was not directly caused by the psychiatric aeromedical evacuation. Rather, a suicide-related aeromedical evacuation was associated with an increased likelihood of separation compared to a psychiatric aeromedical evacuation for another psychiatric reason. This association could be correlated with the severity of symptoms and other comorbid conditions in service members who received suicide-related aeromedical evacuations, to the extent that they no longer were fit for service.

One finding that warrants discussion is the incidence of suicide-related aeromedical evacuation. The incidence of suicide-related aeromedical evacuation was much lower than what might be expected based on prior research related to suicide ideation and attempts.³⁻⁷ The difference might be due to differences in data sources. Prior epidemiological studies used survey methods to collect clinical data, while we used administrative, electronically coded data. It is likely the case that a proportion of service members who had a primary diagnostic code other than suicide (i.e., depressive disorder, PTSD, etc.) may have experienced comorbid suicide-related symptoms that were not specifically coded in the database.

Another noteworthy finding was that a majority of diagnostic codes in our study did not specify suicide attempt method (58%). A possible explanation for this is that military health

providers used codes that would mitigate potential career impact on service members. It may also be the case that military health providers were not fully apprised of suicide attempt code specifications. Additionally, there were only six documented cases of a firearm-related suicide attempt during the study period. The most likely explanation for this is that a completed suicide by firearm in theater would not result in an aeromedical evacuation. A study incorporating Department of Defense Suicide Event Report data for these service members could help illuminate outcome differences.

CONCLUSIONS

Suicide remains a significant problem in the U.S. military. Findings from this study suggest that suicide is also relevant in the context of psychiatric aeromedical evacuation. Compared to aeromedical evacuation for other psychiatric reasons, a suicide-related aeromedical evacuation is more likely to be a career-ending event. In many cases, the psychiatric aeromedical evacuation of a service member for suicidal ideations and their subsequent discharge from active duty is in the best interest of the individual and the military. However, the significant consequences associated with any psychiatric aeromedical evacuation also suggest that the military might benefit from an increased emphasis on indicated prevention for individuals who show sufficient early signs of crisis and functional problems so that specialized interventions can be used in theater to prevent suicide. Indicated prevention interventions should begin with leaders' awareness and mitigation of risk. This may include increased efforts to train leaders to identify service members who are having trouble fitting in and are withdrawn or who having difficulty performing their jobs and then to mitigate the risk before it reaches a crisis, such as suicide. When feasible, delivery of evidence-based treatments such as brief cognitive-behavioral therapy for suicide²⁷ may be beneficial to reduce symptoms and help service members

remain in theater and complete their tour of duty. Preliminary findings on treatment of posttraumatic stress symptoms in a combat zone have demonstrated that evidence-based psychotherapy can be safely and effectively adapted for delivery to deployed military personnel.²⁶ Future research should evaluate the feasibility, safety, and efficacy of delivering suicide-related interventions in theater.

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Characteristic	Total		Suicide-Related		Other Psychiatric		χ^2	P
	N	%	n	%	n	%		
Male	5895	83.9	175	72.3	5720	84.4	25.12	< .001
Age							3.10	.21
≤ 30	5606	79.8	204	84.3	5402	79.7		
31 – 40	1179	16.8	32	13.2	1147	16.9		
≥ 40	236	3.4	6	2.5	230	3.4		
Race/Ethnicity							14.71	.01
Caucasian	4636	66.6	133	55.9	4503	67.0		
African American	1101	15.8	54	22.7	1047	15.6		
Hispanic	668	9.6	28	11.8	640	9.5		
Asian	179	2.6	6	2.5	173	2.6		
Other	375	5.4	17	7.2	358	5.3		
Marital Status							2.29	.32
Married	3850	54.8	127	52.5	3723	54.9		
Never Married	2797	39.8	97	40.1	2700	39.8		
Divorced/Other	376	5.4	18	7.4	358	5.3		
Education							3.58	.47
≤ High School	5932	84.5	205	84.7	5727	84.5		
HS – Some College	520	7.4	23	9.5	497	7.3		
≥ Bachelor's Degree	492	7.1	13	5.3	479	7.1		
Branch							19.26	< .001
Army	5418	77.1	187	77.3	5231	77.1		
Marine Corps	671	9.6	10	4.1	661	9.7		
Air Force	542	7.7	33	13.6	509	7.5		
Navy	392	5.6	12	5	380	5.6		
Enlisted	6660	95.4	230	96.2	6430	95.4	0.40	.53
Occupation Category							10.37	.006
Combat Service Support	3684	52.5	140	57.9	3544	52.3		
Combat Arms	1779	25.3	40	16.5	1739	25.6		
Combat Support	1560	22.2	62	25.6	1498	22.1		
Number of Deployments							5.63	.13
1	3505	49.9	132	54.5	3373	49.7		
2	2048	29.2	55	22.7	1993	29.4		
3+	1470	21	55	22.7	1415	20.9		
OIF ^a Theater	3400	61%	66	34.7	3334	61.6	55.59	< .001
ISC ^b Separation	3741	53.3	147	60.7	3594	53	5.63	.02
Involuntary Separation	2439	73.7	103	78	2336	73.5	1.35	.245

*Cell counts and proportions are based on available data across variables. ^aOIF, Operation Iraqi Freedom; ^bISC, Inter-service separation codes.

Figure 1. Incidence of aeromedical evacuations from theater by year.

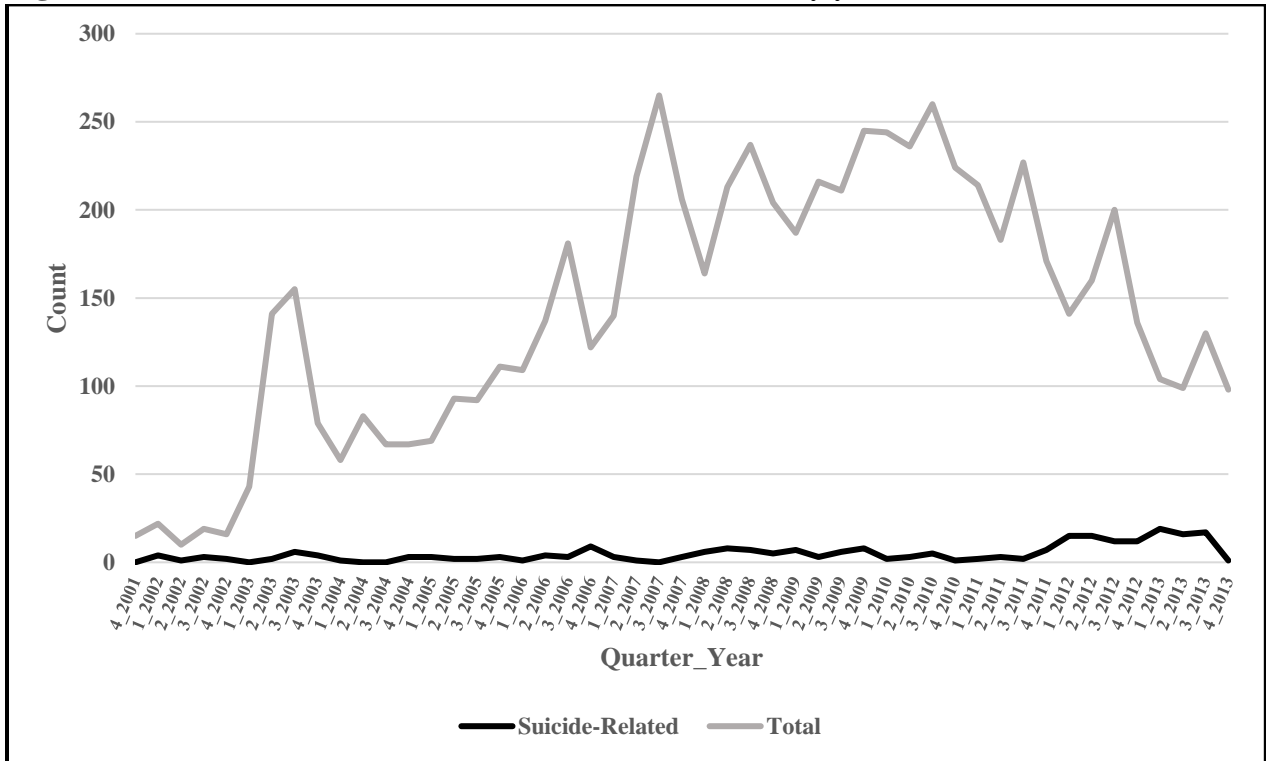


Figure 2. Incidence of suicide-related aeromedical evacuations from theater by year.

