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ABSTRACT Limited research exists regarding the rates of and outcomes associated with psychiatric comorbidity among active duty military personnel. This study investigated the rates of comorbid psychiatric diagnoses among 81,720 U.S. Marines, and assessed the relationships between preexisting comorbid disorders and risk of psychiatric hospitalizations and attrition from service. The study used medical, deployment, and personnel records for all Marines who enlisted between 2002 and 2005. The baseline rate of comorbidity was 1.3% for Marines who deployed during the first term of service, and 6.3% for Marines who did not deploy. The most common baseline comorbidity among deployed Marines was mood disorders with anxiety disorders, and mood and adjustment disorders among nondeployed Marines. Logistic regression analyses revealed Marines with comorbid diagnoses before deployment were over three times more likely to attrite (odds ratio = 3.4, $p < 0.001$) and over five times more likely to be hospitalized for psychiatric symptoms (odds ratio = 5.1, $p < 0.001$) following deployment than those with no diagnoses. Similar patterns emerged among nondeployers. Outcomes associated with comorbid conditions were substantially worse than outcomes for single conditions. These findings demonstrate that Marines with a history of comorbid psychiatric diagnoses are at a much greater risk for adverse outcomes, specifically attrition from the military and psychiatric hospitalization.

INTRODUCTION

The United States' concurrent involvement in Operation Iraqi Freedom and Operation Enduring Freedom (OIF/OEF) has energized research documenting longitudinal outcomes associated with psychiatric conditions among a new generation of military veterans.[1–3] To date, most mental health research within this population has focused on the health and career outcomes associated with specific and singular psychiatric outcomes such as post-traumatic stress disorder (PTSD) and depression.[1–3] In contrast, relatively little attention has been given to comorbidities in military populations, such as co-occurring PTSD and depression. Considering the potential size and seriousness of the issue, it is critical to initiate research on psychiatric comorbidity and related implications among service members.

Studies of civilian populations indicate that psychiatric comorbidity is common in clinical settings, affecting approximately half of all psychiatric patients.[4–6] Moreover, patients with comorbid conditions often typify the most severe psychiatric cases, presenting increased risks for numerous markers of morbidity. For example, individuals with comorbid disorders face worse health outcomes, worse physical and social functioning, a diminished likelihood of recovery, and increased rates of attempted and completed suicide compared with those with solitary disorders.[7–13] Psychiatric comorbidity also affects occupational outcomes. For example, previous research has shown that workers with two or more mental disorders lose more days of work each month than those with single disorders.[14]

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Psychiatric comorbidity is clearly an issue of great importance and has the potential to influence service member readiness and retention, yet it remains largely unexplored in military populations. To our knowledge, only one study has documented comorbidity within a sample of formerly active duty OIF and OEF veterans. Seal et al[15] found that of 106,726 OIF and OEF veterans seeking care, over half had multiple psychiatric diagnoses. However, this study does not provide information regarding comorbidity during active service.

An area of particular research importance is the impact of diagnosed psychiatric comorbidity on attrition and severe mental health outcomes over the course of each service term. It is well documented that poor mental health is a leading cause of separation from service (both early and planned) among military personnel, especially among those who have been deployed to a combat zone.[16,17] However, it is unknown if service members with multiple psychiatric conditions early in their careers experience additional attrition risks.

In addition, it is unknown whether comorbid psychiatric disorders increase the risk of severe psychiatric symptoms, such as episodes requiring hospitalization. Mental disorders were the leading cause of military hospitalizations in 2009, 2010, and 2011,[18–20] signifying a need for increased investigation of predictive factors. Information regarding the prevalence and consequences of comorbidity could be invaluable for understanding the rise in hospitalization rates, and for informing screening policies and treatment practices.

The objectives of this study were to (1) determine the rate of psychiatric comorbidity among a sample of enlisted U.S. Marine Corps personnel, (2) assess the relationship between early career psychiatric comorbidity and future psychiatric hospitalization, (3) assess the relationship between early career psychiatric comorbidity and attrition, (4) determine the new-onset incidence rate of psychiatric comorbidity following initial deployment, and (5) determine the most prevalent types of

psychiatric comorbidities throughout the observation period. We hypothesized that the rates of psychiatric comorbidity among mental health patients would be considerable due to high rates reported in civilian and veteran populations.[4–6,15] Based on the evidence suggesting persons with psychiatric comorbidity represent the most severe psychiatric cases,[4] we hypothesized that service members with comorbid disorders would be at greater risk for hospitalization. Finally, since poor mental health has been shown to be related to attrition from service among military personnel,[1,3,16,21] we hypothesized that service members with comorbid disorders would be at an increased risk for attrition.

METHODS

Participants

Primary Study Group

For the current study, personnel and medical records for all Marines enlisting for their initial 4-year term during fiscal years 2002 to 2005 were obtained (n = 136,300). To allow for examination of postcombat outcomes among Marines deploying with preexisting mental disorder diagnoses, inclusion in the "primary" study group was contingent upon combat deployment status and a 6-month postdeployment follow-up period. All Marines who did not deploy to a combat zone (i.e., Iraq or Afghanistan) or who did not return from their first combat deployment within the first 3 years of their first term were excluded from the primary group (n = 70,451). Marines who died (n = 324) or transferred to another military branch during the study period (n = 141) were also excluded. Finally, all officers (n = 1,494) were excluded based on dissimilarities in selection criteria, training, and demographic characteristics of officers versus enlisted personnel. The final primary study group included 63,890 Marines.

Supplemental Study Group

Supplemental analyses were conducted on a subset of Marines who did not deploy despite serving for a minimum of 18 months. The 18-month tenure was selected because it corresponds to the mean time between accession and start of first deployment in the primary study group. All other inclusion criteria were the same, yielding an analysis group of 17,830 nondeployed Marines. Reasons for nondeployment could not be ascertained from the data files available; however, prior evidence indicates that nondeployers on average have significantly higher initial rates of early career psychiatric disorders,[1] potentially contributing to unsuitability for deployment. This phenomenon is referred to as "the healthy warrior effect," because service members who either attrite early (before a deployment) or are deemed ineligible for deployment are often not as "healthy" as those that deploy.[1] Thus, awareness of potentially consequential differences between the primary (deployed) and supplemental (nondeployed) groups is essential.

Procedure

Preexisting medical and personnel records were used in this study. We obtained personnel data from the Defense Manpower Data Center, which operates under the Office of the Secretary of Defense and includes information on enlistment, deployment, retention, attrition, cognitive ability, and demographics. Medical records were obtained from TRICARE Management Activity and included both inpatient and outpatient medical encounters reimbursed through TRICARE during military service,[22] except for medical encounters occurring in a combat zone. The diagnoses listed in TRICARE and used in the current study represent a condition for which a trained practitioner provided treatment. We excluded medical visits in which a patient was evaluated for a mental health condition but not diagnosed with or treated for that condition. Military policies regarding psychiatric conditions are based on standards and diagnoses adopted by the American Psychiatric Association,[23] and reflect the views and assumptions of mainstream psychiatry.

In addition to basic demographic variables available in our databases, we included a measure of cognitive ability in our analysis to explore potential covariation with attrition and psychiatric hospitalization. Significant associations have previously been reported between cognitive ability and mental disorders,[24–26] and cognitive ability and negative behavioral outcomes.[27,28] In the present study, scores from the Armed Forces Qualification Test (AFQT), a measure shown to correlate with standardized intelligence tests,[29] were trichotomized into thirds to represent low, moderate, and high cognitive ability.

Medical records were examined for baseline psychiatric disorder diagnoses, and participants were divided into comparison groups based on the presence or absence of a baseline psychiatric disorder. Participants were classified as having a psychiatric disorder if their medical records included an International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic code between 290.00 and 316.00 before the start of their first combat deployment (excluding 305.10 tobacco disorder, 307.81 tension headache, and 310.20 postconcussion syndrome). Psychiatric disorders were classified into the following seven major categories: substance abuse (excluding tobacco), adjustment disorders, mood disorders, psychotic disorders, anxiety disorders, personality disorders, and "other" mental disorders (including, but not limited to, eating and sleep disorders). The diagnostic categories were selected based on methodology applied in previous research.[16] Previous research used eight categories; however, we merged the somatoform, dissociative, and factitious disorders category with "other disorders" due to the low prevalence of these diagnoses in the current sample.

To identify participants with comorbid categories of disorders, baseline disorder groups were further stratified by number of diagnoses spread across major diagnostic categories. For example, participants with both an anxiety and personality disorder diagnosis were identified as having

comorbid disorders, whereas those with two different anxiety disorder diagnoses were coded as single-disorder cases. The criteria for classifying comorbidity was based on the original definition provided by Feinstein (1970), which states that "comorbidity will refer to any distinct additional clinical entity that has existed or that may occur during the clinical course of . . . disease" (p. 456).[30] In recent years, it has been argued that the reported rates of psychiatric comorbidity have been inflated due to a lack of diligence in distinguishing between "distinct" conditions.[31,32] Therefore, the criteria applied in the current study was designed to identify true cases of co-occurring unique disorders.

Participants in the primary sample were followed for a 6-month period after their first combat deployment to identify postdeployment hospitalizations and attrition from service. Participants in the supplemental sample were followed from their 18th-to-54th month of service to determine hospitalizations and attrition. Hospitalizations were identified through a search of medical records for hospitalizations attributed to psychiatric illnesses. For the primary sample, participants who were still active for 6 months postdeployment or who completed their full term (n = 63,478) were classified as having no or regular discharge from service, while participants who exited the service before the end of their obligated term were classified as early attrition cases (n = 412). For the supplemental sample of nondeployers, we dichotomized subjects based on the occurrence of attrition (yes/no) between 18 and 54 months of service.

Analysis

Descriptive statistics including means and percentages were calculated for the full sample and each individual study group for all demographic, deployment, and mental health variables. Pearson chi-square tests for proportions were used to compare demographic variables between study groups. Univariate and hierarchical multivariate logistic regression models were used to examine associations between baseline mental health status and postdeployment hospitalization and attrition. In the final multivariate regression models, demographic variables were included in the first step, and variables significant in the bivariate calculations were added in the second step. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were calculated for each variable. Statistical significance was set at p <0.05 (two tailed) for all analyses. Statistical analyses were performed using SPSS software, version 19.0 (SPSS, Inc., Chicago, Illinois).

RESULTS

Study Group Comparisons

The final study sample size was 81,720 Marines, including 63,890 in the primary study group (i.e., deployed) and 17,830 in the supplemental study group (i.e., nondeployed). Comparison testing was performed to identify differences between the primary and supplemental study groups (data not shown). Nondeployed participants were slightly older (mean = 2.22, SD = 1.99) than deployed participants (mean = 21.16, SD = 2.01; $t(81,716) = 3.75$, $p < 0.001$). There were significantly more females in the nondeployed group (14.8% versus 3.6%; $\chi^2 = 3079.4$, $p < 0.001$), and fewer nondeployed Marines were classified as "high" cognitive ability (29.6% versus 32.1%; $\chi^2 = 40.3$, $p < 0.001$). Significantly more nondeployed Marines had one psychiatric diagnosis at baseline (8.2% versus 3.8%; $\chi^2 = 595.3$, $p < 0.001$). Additionally, more nondeployed Marines had two or more diagnoses at baseline (6.3% versus 1.3%; $\chi^2 = 1493.3$, $p < 0.001$).

Primary Study Group

Participant Characteristics

Slightly more than 5% of participants in the primary study group (n = 3,258) had at least one psychiatric disorder diagnosis on record at baseline. Table I shows descriptive statistics for combat-deployed Marines by baseline mental health status. Table I also indicates the results of group comparison tests. Marines in the one or more disorder baseline group were significantly older than the no disorder group ($p < 0.001$) and significantly more likely to be female ($p < 0.001$), white ($p < 0.001$), and classified as "moderate" cognitive ability by the AFQT ($p < 0.05$). Additional comparisons (not shown) made between the single disorder group (n = 2,430) and comorbid diagnoses group (n = 828) revealed similar differences (data not shown). Marines with comorbid disorders were more likely to be female ($p < 0.001$), white ($p < 0.001$), and of "low" cognitive ability ($p < 0.05$).

TABLE I. Demographic and Career Characteristics of Combat-Deployed Marines With and Without Baseline Psychiatric Disorder Diagnoses, 2002 to 2005

	No Diagnoses[a] (N = 60,632)		One or More Disorders[b] (N = 3,258)	
Variables	Mean (SD) or n (%)			
Age at First Deployment	21.16 (2.01)		21.65 (2.02)***	
Sex				
Male	58,548	(96.6)	3,024	(92.8)***
Female	2,084	(3.4)	234	(7.2)***
Race/Ethnicity				
White	42,760	(71.4)	2,464	(76.6)***
Hispanic	9,518	(15.9)	397	(12.3)***
Black	4,500	(7.5)	199	(6.2)**
Other	3,098	(5.2)	159	(4.9)
AFQT				
High	19,321	(32.2)	1,006	(31.2)
Moderate	18,587	(31.0)	1,067	(33.1)*
Low	22,119	(36.8)	1,150	(35.7)
Location of First Combat Deployment				
OIF	57,496	(94.8)	3,088	(94.8)
OEF	3,136	(5.2)	170	(5.2)

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. [a]Column totals may not equal 100% due to missing data. [b]Significance tests reflect comparisons of "any" diagnosis category with "no diagnoses" category.

Prevalence and Incidence

The baseline rate of diagnosed psychiatric disorders was 5.1% (n = 3,258), and 1.3% of the sample had comorbid psychiatric disorders (n = 828), representing 25.4% of all psychiatric patients (data not shown). By the end of the study period, the comorbidity rate in this cohort increased to 3.3% (n = 2,108), corresponding to a crude incidence rate of 2.0%.

Predictors of Psychiatric Hospitalizations Following Combat Deployment

Less than 1% of Marines (n = 432) were hospitalized for a psychiatric health issue during the observation period (data not shown). The percentage of Marines who were hospitalized for psychiatric concerns after deployment increased with each additional predeployment psychiatric diagnosis; 0.6% of Marines with no pre-deployment diagnoses on record, 1.3% of Marines with a singular diagnosis, and 2.7% of Marines with two or more pre-deployment diagnoses received in-patient psychiatric care following return from deployment (results not shown). At the bivariate level, only female gender (OR = 1.6, $p < 0.05$) and predeployment psychiatric diagnoses (OR = 2.1, $p < 0.001$ one diagnosis; OR = 5.0, $p < 0.001$ two or more diagnoses) were predictive of post-deployment hospitalization (Table II). Multivariate analysis revealed that predeployment diagnoses significantly predicted postdeployment hospitalizations; Marines with baseline comorbidity were over five times more likely to be hospitalized for psychiatric symptoms following deployment than those with no baseline diagnoses (OR = 5.1, $p < 0.001$). Female gender also remained a significant predictor of post-deployment psychiatric hospitalization at the multivariate level (OR = 1.6, $p < 0.05$).

TABLE II. Variables Associated With Postdeployment Hospitalization due to Psychiatric Symptoms Among 63,890 Combat-Deployed Marines

Variables	Univariate OR (95% CI)		Multivariate OR (95% CI)	
Step 1				
Age at First Deployment (Mean [SD])	0.9	(0.9–1.0)	0.9	(0.9–1.0)
Sex				
Male (Ref)	1.0		1.0	
Female	1.6	(1.1–2.5)*	1.6	(1.0–2.4)*
Race				
White (Ref)	1.0		1.0	
Hispanic	0.8	(0.6–1.1)	0.8	(0.6–1.1)
Black	0.9	(0.6–1.3)	0.9	(0.6–1.3)
Other	1.1	(0.7–1.7)	1.1	(0.7–1.7)
AFQT				
High (Ref)	1.0		1.0	
Moderate	1.1	(0.8–1.4)	1.1	(0.8–1.4)
Low	1.2	(0.9–1.5)	1.2	(0.9–1.6)
Step 2				
Baseline Psychiatric Disorders				
0 (Ref)				
1	2.1	(1.4–3.0)***	2.2	(1.5–3.2)***
2 or More	5.0	(3.3–7.5)***	5.1	(3.4–7.7)***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Predictors of 6-Month Attrition Following Combat Deployment

Of the 63,890 Marines included in the analysis, 412 (0.06%) attrited following deployment. The percentage of Marines who attrited after deployment increased significantly as a function of predeployment psychiatric diagnoses; 0.6% of Marines with no predeployment diagnoses on record, 1.3% of Marines with a singular diagnosis, and 2.5% of Marines with comorbid predeployment diagnoses attrited in the 6 months following return from deployment (results not shown). Factors associated with attrition from military service among Marines are shown in Table III. Baseline psychiatric diagnoses, postdeployment hospitalization for psychiatric issues, ethnicity, and AFQT were all significantly related to attrition at both the bivariate and multivariate levels. Postdeployment hospitalization for psychiatric issues was included in Step 2 of the hierarchical model due to the high probability that Marines with psychiatric symptoms severe enough to warrant hospitalizations would attrite. Accordingly, Marines with a postdeployment psychiatric hospitalization were 17 times more likely to attrite than nonhospitalized Marines (OR = 17.2, $p < 0.001$).

TABLE III. Variables Associated With Postdeployment Attrition Among 63,890 Combat-Deployed Marines

Variables	Univariate OR (95% CI)	Multivariate OR (95% CI)
Step 1		
Age at First Deployment	0.9 (0.9–1.0)	0.9 (0.9–1.0)
Sex		
Male	1.0	1.0
Female	1.0 (0.6–1.8)	0.9 (0.5–1.5)
Race		
White	1.0	1.0
Hispanic	0.5 (0.4–0.8)***	0.5 (0.3–0.7)***
Black	1.5 (1.1–2.1)**	1.4 (1.0–1.9)*
Other	0.5 (0.3–0.9)*	0.6 (0.3–1.0)*
AFQT		
High	1.0	1.0
Moderate	1.3 (0.9–1.6)	1.2 (0.9–1.6)
Low	1.6 (1.3–2.1)***	1.5 (1.2–1.9)***
Step 2		
Postdeployment Hospitalization		
None	1.0	1.0
1 or More	19.4 (14.0–26.9)***	17.2 (12.2–24.2)***
Step 3		
Baseline Psychiatric Disorders		
0	1.0	1.0
1	2.2 (1.5–3.1)***	2.0 (1.4–2.9)***
2 or More	4.4 (2.8–6.8)***	3.4 (2.1–5.4)***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

After controlling for hospitalization, Marines with comorbid diagnoses before deployment were still over three times more likely to attrite following deployment than those with no diagnoses (OR = 3.4, $p < 0.001$) in the multivariate model. Additionally, Hispanic descent emerged as a protective factor; Hispanic participants attrited half as often as White participants did (OR = 0.5, $p < 0.001$). Finally, the rates of attrition from service were significantly higher among Marines in the lowest AFQT classification (OR = 1.5, $p < 0.001$).

Secondary Study Group

Participant Characteristics

Nearly 15% (n = 2,584) of the 17,830 nondeployed Marines had at least one psychiatric diagnosis on record within the first 18 months of service (data not shown). Marines without psychiatric diagnoses were more likely to be classified as "high" cognitive ability (30.1% vs. 26.3%; $\chi^2 = 15.1$, $p < 0.001$) and less likely to be classified as "low" cognitive ability (35.9% vs. 39.5%; $\chi^2 = 12.2$, $p < 0.001$) than Marines with psychiatric diagnoses. Significantly more females than males had one or more disorders (19.8% vs. 13.5%; $\chi^2 = 58.3$, $p < 0.001$). Age differences were nonsignificant.

Prevalence and Incidence

Of the 2,584 nondeployed participants with at least one psychiatric diagnosis at baseline, nearly half (n = 1,125, 43.5%) had comorbid disorders, representing a baseline prevalence of 6.3% (data not shown). At the end of the observation period, the prevalence of comorbidity increased to 13.9% (n = 2,479), indicating a crude incidence rate of 7.6%.

Predictors of Psychiatric Hospitalizations

Over 3% (n = 599) of nondeployed Marines were hospitalized for psychiatric reasons during the follow-up observation period (i.e., after 18 months of service). Hospitalizations increased with the number of baseline psychiatric diagnoses; 2.6% of participants with no baseline diagnoses, 6.4% with one diagnosis, and 9.9% with comorbid diagnoses were subsequently hospitalized. Multivariate analysis revealed that Marines with one baseline psychiatric diagnosis (OR = 2.4, $p < 0.001$) or comorbid baseline diagnoses (OR = 3.8, $p < 0.001$) were more likely to be hospitalized than those with no baseline diagnoses. Also, female gender (OR = 1.9, $p < 0.05$) and low cognitive ability (OR = 1.3, $p < 0.05$) were associated with increased risk of hospitalization, but Hispanic ethnicity had a protective effect (OR = 0.7, $p < 0.05$).

Predictors of 6-Month Attrition Following Combat Deployment

Nearly one-third (n = 5,742) of the 17,830 nondeployers attrited after the first 18 months of active service. As with hospitalization, attrition increased with baseline psychiatric diagnoses. Specifically, 28.5% of participants with no baseline diagnoses, 51.5% with one diagnosis, and 60.6% with two or more diagnoses attrited. Multivariate analysis showed that, after controlling for baseline hospitalizations, baseline diagnoses predicted attrition; Marines with a singular baseline diagnoses were over two times as likely to attrite (OR = 2.7, $p < 0.001$) and those with comorbid diagnoses were over three times as likely to attrite (OR = 3.8, $p < 0.001$) as Marines with no baseline disorders. Female gender (OR = 0.5, $p < 0.001$) and Hispanic ethnicity (OR = 0.7, $p < 0.001$) were also protective against attrition, whereas low (OR = 1.4, $p < 0.001$) and moderate cognitive ability (OR = 2.0, $p < 0.001$) increased the odds of attrition.

Distribution of Comorbid Disorders

Table IV shows the frequency of observed comorbidities for the entirety of the observation period. Values listed below the diagonal represent the primary deployed study group, and values above the diagonal represent the supplemental nondeployed study group. It is important to note that because participants could have diagnoses in more than two categories

TABLE IV. Comorbid Psychiatric Diagnoses by Broad Diagnostic Category Among 4,587 Marines With Comorbid Diagnoses[a]

	Mood[b]	Anxiety	Adjustment	Other	Personality	Substance Abuse	Psychotic
				N (%)			
Mood	—	642 (25.9)	904 (36.5)***	751 (30.3)***	687 (27.7)***[c]	566 (22.8)***	62 (2.5)
Anxiety	583 (26.3)	—	480 (19.4)***	446 (17.9)*	345 (19.1)**	348 (14.0)**	40 (1.6)
Adjustment	501 (22.6)***	395 (17.9)***	—	681 (27.4)*	615 (24.8)***[c]	479 (19.3)***	42 (1.7)***
Other	442 (19.9)***	389 (17.6)***	417 (18.8)***	—	509 (20.5)**[c]	437 (17.6)**	63 (2.5)***[c]
Personality	313 (14.2)***[c]	202 (9.1)***	291 (13.1)***[c]	221 (10.0)	—	322 (12.9)***	55 (2.2)***[c]
Substance Abuse	367 (16.6)**	365 (16.5)	275 (12.4)***	259 (11.7)***	157 (7.0)*	—	45 (1.8)
Psychotic	34 (1.5)*[c]	23 (1.0)	20 (0.9)	24 (1.0)	16 (0.7)	14 (0.6)	—
Deployers (n = 2,108)	1,151 (35.3)	1,065 (32.7)	1,008 (30.9)	862 (26.4)	527 (16.2)	718 (22.0)	50 (1.5)
Nondeployers (n = 2,479)	1,988 (76.9)	1,203 (46.6)	1,865 (72.2)	1,594 (61.7)	1,030 (39.9)	2,135 (82.6)	106 (4.1)

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. [a]Significance tests reflect tests of probability comparing observed and expected rates of comorbidity. [b]Column totals indicate number of diagnoses per individual diagnostic category; column totals do not match because categories are not mutually exclusive. [c]Observed value is higher than expected value.

the column totals in Table IV exceed 100%. Among the 2,108 deployed Marines with co-occurring diagnoses across the study period, the most common comorbidities observed were anxiety and mood disorders (n = 583, 26.3%), followed by adjustment and mood disorders (n = 501, 22.6%), and mood and other disorders (n = 442, 19.9%). Among the 2,479 nondeployed Marines with co-occurring diagnoses, the most common comorbidities were adjustment and mood disorders (n = 904, 36.5%), mood and other disorders (n = 751, 30.3%), and mood and personality disorders (n = 687, 27.7%).

Pearson chi-square tests were used to compare the observed versus expected rates of comorbidity between each diagnostic category, as a way to identify specific comorbidities occurring at statistically significant rates. These tests revealed many significant discrepancies between the observed and expected rates of comorbidities between diagnostic categories. In almost all cases, the observed rates of comorbidity were significantly lower than the expected rates (Table IV). However, the comorbidities of personality and mood disorders and personality and adjustment disorders were higher than expected among both study groups. Additionally, among nondeployers only, the observed rates of co-occurring personality and other disorders, other and psychotic and disorders, and personality and psychotic disorders were higher than expected.

DISCUSSION

This study examined the rates, types, and implications of psychiatric comorbidity among a large sample of active duty Marine Corps personnel. Previous research in civilian populations has documented comorbidity rates as high as 55% among those with psychiatric disorders,[4,5] but no studies have documented the diagnosed rates among active duty military personnel. Furthermore, civilian research has established a connection between comorbid psychiatric disorders and adverse heath and career outcomes,[7–14] but these relationships have remained largely unexplored among active duty military personnel.

In this study, comorbidity prevalence among nondeployers (48.7% of patients) corresponds to previous comorbidity estimates in the general population[4] and veteran samples.[15] Conversely, the rate of comorbidity among deployed Marines (25.4% of patients) was significantly lower. The large discrepancy is consistent with "Healthy Warrior" observations,[1] which suggest service members eligible for deployment may be healthier than those who do not deploy. Nevertheless, the conservative approach used to classify diagnoses should be considered when comparing results across studies.

A key finding of this study was the increase in prevalence of comorbidity over time, which has not previously been reported. In general, the number of Marines with comorbid disorders was small, just over 3% of deployers, and fewer than 14% of nondeployers had multiple diagnoses on record by the conclusion of the observation period. What is surprising is the large prevalence increase over time. Specifically, the comorbidity rate nearly tripled following combat deployment among deployed Marines, and doubled after 18 months of service among nondeployed Marines. The large increases in psychiatric comorbidity suggest this is an issue warranting further research, particularly among Marines who have deployed.

This study also investigated mental health-related hospitalizations following combat deployment or months 18 to 54 of service for nondeployers. We found that among deployed Marines with baseline psychiatric comorbidity, the likelihood of hospitalization within 6 months postdeployment was five times greater than for Marines with no baseline diagnoses. Similarly, nondeployed Marines with baseline comorbidity were over three times more likely to be hospitalized after 18 months of service. Given the recent rise in mental health-related military hospitalizations,[20] this information suggests that heightened comorbidity screening is needed among service members, for whom the primary concern in recent years has been the presence of PTSD and depression. To our knowledge, the added detriment associated with equally common conditions such as adjustment disorder has not been studied. Targeted intervention among patients with preexisting psychiatric comorbidity may reduce the need for future hospitalizations.

We also examined the relationship between preexisting psychiatric comorbidity and attrition following combat deployment or the first 18 months of service. The link between attrition from military service and psychiatric disorders has been established in numerous prior studies,[1–3,17,21] but none specifically examined associations between psychiatric comorbidity and attrition. Our results showed that in both deployed and nondeployed study groups, Marines with two or more baseline psychiatric disorders were over three times more likely to attrite following deployment compared to Marines with no prior diagnosis, and twice as likely to attrite compared to Marines with a singular diagnosis. These results indicate risk for attrition progressively increases based on number of diagnoses. It should be noted, however, that the majority of deployed Marines and nondeployed Marines with diagnoses were able to complete their service term.

A number of demographic variables also influenced postdeployment attrition. Ethnicity and cognitive ability (as measured by AFQT score) were significant predictors of postdeployment attrition from service. Hispanic ethnicity was a protective factor for attrition. This finding is consistent with past research, which has documented lower rates of attrition among Hispanic service members when compared with other groups.[33,34] Additionally, low AFQT scores increased the risk for attrition. The protective effect of high cognitive ability found in this study is consistent with other work on attrition.[35]

Several limitations of the current study should be addressed. First, we used TRICARE Management Activity medical records, which only capture medical encounters that

are reimbursed through the military health care network. Mental health care from non-TRICARE providers were not included in our data. Furthermore, out of fear of stigmatization, many afflicted individuals may have avoided treatment altogether. Second, to avoid confounds associated with additional deployments, we only followed primary study group participants for 6 months postdeployment. The observation limit likely means our comorbidity rates underestimate the true career span prevalence. Third, no data were available regarding deployment experiences such as combat exposure, so this study could not determine the extent to which deployment experiences affected the postdeployment outcomes of interest. Finally, direct comparisons between the two study groups were not performed because of the likelihood that many nondeployed Marines may have been ineligible for deployment due to underlying behavioral, health, and/or administrative reasons. Study strengths include the longitudinal nature of the data, and that diagnoses were derived from medical records as opposed to self-report instruments, which have been shown to have low validity in military samples.[36]

It is evident that comorbidity is a compelling metric of health and service outcomes and should be routinely captured in mental health surveillance efforts. Currently, military policy does not address procedures for evaluating the operational readiness and resilience of personnel with multiple psychiatric concerns. This may be, in part, due to a scarcity of research on comorbidity in military populations, as compared to the large number of studies examining single conditions such as PTSD. The current study provides evidence to show that the cumulative effects of concomitant mental health conditions are strongly associated with attrition and hospitalization. Future research should use additional sources of data to examine the impact of psychiatric comorbidity on U.S. military personnel. As work progresses, there may be a need to revise clinical practices and military policies for such cases. In particular, there is a need to examine whether allocation of clinical resources is sufficient for military personnel with comorbid mental disorders.

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14. ABSTRACT

Objective. The objectives of this study were to determine the baseline prevalence of comorbid mental disorder diagnoses among combat-deployed United States Marine Corps personnel and to assess the relationships between baseline comorbid disorders and post-deployment psychological health and career outcomes.
Method. The current study examined medical, deployment, and career records for 136,300 U.S. Marines who enlisted between 2002 and 2005.
Results. The overall prevalence of psychiatric comorbidity at baseline was 1.3%, while the overall prevalence by the end of the study period was 3.5%. The strongest predictors of receiving one or more psychiatric diagnoses following first combat deployment were comorbid and singular baseline disorders. Comorbid baseline mental health diagnoses also greatly increased the risk of attrition. Compared with participants with no postdeployment psychiatric diagnoses, participants with two or more postdeployment diagnoses were thirteen times more likely to attrite, and participants with one postdeployment diagnosis were five times more likely to attrite.
Conclusion. Comorbid psychiatric diagnoses were consistently the strongest predictor of negative postdeployment psychiatric and career outcomes. This finding suggests that military personnel with a history of multiple mental health disorders who are deployed to a combat zone are at a greater risk for adverse psychiatric outcomes and early attrition from service than Marines with no or one disorder.

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