

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JANUARY 14, 2010

VOL. 362 NO. 2

Deployment and the Use of Mental Health Services among U.S. Army Wives

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ABSTRACT

BACKGROUND

Military operations in Iraq and Afghanistan have involved the frequent and extended deployment of military personnel, many of whom are married. The effect of deployment on mental health in military spouses is largely unstudied.

METHODS

We examined electronic medical-record data for outpatient care received between 2003 and 2006 by 250,626 wives of active-duty U.S. Army soldiers. After adjustment for the sociodemographic characteristics and the mental health history of the wives, as well as the number of deployments of the personnel, we compared mental health diagnoses according to the number of months of deployment in Operation Iraqi Freedom in the Iraq–Kuwait region and Operation Enduring Freedom in Afghanistan during the same period.

RESULTS

The deployment of spouses and the length of deployment were associated with mental health diagnoses. In adjusted analyses, as compared with wives of personnel who were not deployed, women whose husbands were deployed for 1 to 11 months received more diagnoses of depressive disorders (27.4 excess cases per 1000 women; 95% confidence interval [CI], 22.4 to 32.3), sleep disorders (11.6 excess cases per 1000; 95% CI, 8.3 to 14.8), anxiety (15.7 excess cases per 1000; 95% CI, 11.8 to 19.6), and acute stress reaction and adjustment disorders (12.0 excess cases per 1000; 95% CI, 8.6 to 15.4). Deployment for more than 11 months was associated with 39.3 excess cases of depressive disorders (95% CI, 33.2 to 45.4), 23.5 excess cases of sleep disorders (95% CI, 19.4 to 27.6), 18.7 excess cases of anxiety (95% CI, 13.9 to 23.5), and 16.4 excess cases of acute stress reaction and adjustment disorders (95% CI, 12.2 to 20.6).

CONCLUSIONS

Prolonged deployment was associated with more mental health diagnoses among U.S. Army wives, and these findings may have relevance for prevention and treatment efforts.

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N Engl J Med 2010;362:101-9.

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MENTAL HEALTH RESEARCH INVOLVING past warfare indicates that frequent or extended military deployment leads to increased stress, anxiety, and depression among personnel¹⁻³ and their families.⁴⁻⁷ However, current warfare in Iraq and Afghanistan differs greatly from that of other conflicts involving the United States. Combat during the 1991 Gulf War ended quickly and with relatively few U.S. casualties. In contrast, current operations have involved the first sustained ground combat since the Vietnam War, followed by a period of insurgent attacks that regularly maim and kill service personnel. In the same number of months, nearly six times as many hostile deaths occurred during Operation Iraqi Freedom in the Iraq-Kuwait region as occurred as a result of the first Gulf War (August 1990 to September 1991).^{8,9}

Studies show considerable mental health problems in a large proportion of U.S. soldiers and Marines returning from Iraq and Afghanistan.^{2,10,11} The psychosocial burden on families of deployed military personnel is less well understood and perhaps not comparable to that of previous deployments, given current service conditions. Besides fear for the safety of their loved ones, spouses of deployed personnel often face challenges of maintaining a household, coping as a single parent, and experiencing marital strain due to a deployment-induced separation of an uncertain duration. Studies examining the effects of deployment on spouses have shown increased rates of marital dissatisfaction, unemployment, divorce, and declining emotional health.^{4,7,12} However, previous research was often limited to short deployment periods (i.e., ≤ 6 months)⁷ or limited combat operations (e.g., Operation Desert Storm).^{4,5,7} Furthermore, previous studies have had small samples and low survey response rates and have lacked medical data.

Increased stress among military family members before, during, and after deployment is a potential mechanism for the development of mental health problems. The association between stressful life events and the subsequent onset or recurrence of mental disorders, including depression,¹³⁻¹⁶ substance use and abuse,¹⁷⁻²⁰ and bipolar disorder,^{21,22} is well documented, though not well studied in military families.

We estimated associations between deployment and mental health diagnoses among wives of active-duty U.S. Army soldiers. We hypothe-

sized that the risks of mental health disorders and rates of medical visits yielding mental health diagnoses would be increased among spouses of soldiers with prolonged deployments between 2003 and 2006. In addition, we expected these relationships to vary across specific categories of mental health disorders and to be modified according to demographic variables, as well as according to the mental health history of the wives.

METHODS

PARTICIPANTS

We examined electronic medical-record data for all outpatient medical visits between January 1, 2003, and December 31, 2006, by wives of active-duty Army personnel who either received outpatient care at a U.S. military treatment facility or used military medical insurance for an outpatient medical visit at a nonmilitary health care facility. These patients were 18 to 48 years of age. We imposed an age ceiling of 48 years because the distribution of age according to the months deployed for the study period indicated a sharp decrease in the deployment of soldiers with wives who were 45 years of age or older. Although the mandatory age of retirement for Army personnel is 62 years (which increased in 2006 from 55 or 60 years, depending on rank^{23,24}), most personnel retire or leave the service well before this age,²⁵ and we assumed that spouses were generally similar in age.

We excluded wives of Reserve and National Guard personnel, since their beneficiaries do not generally receive military medical benefits until the service member is called up to active duty. Furthermore, we included only wives of military members who had been in active-duty service for a minimum of 5 years as of January 1, 2007. A 5-year period was required to exclude families of personnel who enlisted during the 4-year study period and included an additional year immediately before the study to establish a recent mental health history. We compared demographic characteristics of the women as well as characteristics of their spouses for women with and those without this 5-year minimum. We found the two groups to be remarkably similar, suggesting little selection bias except for time in military service.

Preliminary analyses included husbands and wives, but the stratified estimates for women

alone were approximately the same as those for the two sexes combined, whereas the stratified estimates for men were highly unstable. Without persuasive evidence that male spouses had a similar pattern of effects, it was not appropriate to generalize these results to husbands and wives. Therefore, we opted to be conservative and restrict our analyses to wives (approximately 95% of the complete sample); this limited the generalizability of our results accordingly.

DATA SOURCES AND MEASURES

Outpatient medical data were obtained from the Standard Ambulatory Data Record and from TRICARE enrolled-dependent data. The Standard Ambulatory Data Record, a mandatory collection and reporting system for all outpatient medical visits at military medical facilities, is stored in the Defense Medical Surveillance System and maintained by the Armed Forces Health Surveillance Center. TRICARE enrolled-dependent data feed into the surveillance system and contain complete information on billing codes for medical care received outside a military medical treatment facility but with the use of the military's medical insurance system. A military member's rank, total time in the service, and active duty as of January 1, 2007; the total number of months deployed in Operation Iraqi Freedom or Operation Enduring Freedom in Afghanistan from January 1, 2003, through December 31, 2006; and the total number of deployments for these operations during the same period were derived from Defense Manpower Data Center records.

MENTAL HEALTH DIAGNOSES

A mental health diagnosis was defined as the assignment of a mental health–related code from the *International Classification of Diseases, 9th Revision* (ICD-9), for a given outpatient medical visit. Diagnoses were classified into 1 of 17 categories of disorders: alcohol use; anxiety; bipolar disorder; delirium, dementia, and other cognitive disorders; depression; dissociative disorder; drug use; impulse control disorder; pediatric behavioral disorder (mental health–related codes in this category were assigned to some women in their late teens and early 20s); personality disorder; psychotic disorder; sleep disorder; somatoform and factitious disorders; and four stress-related categories: acute stress reaction and adjustment disorder, neurotic disorder, post-traumatic stress disorder, and other

stress disorders (see the Supplementary Appendix, available with the full text of this article at NEJM.org for ICD-9 codes according to category). To increase the sensitivity and specificity of a code for a current mental health diagnosis, we excluded mental health conditions that were associated with codes assigned during the study period that indicated that the condition was in full or partial remission. The outpatient mental health history in the 3 years before the study period (January 1, 2000, through December 31, 2002) was determined with the use of diagnoses in these same 17 categories and included codes for remission.

STATISTICAL ANALYSIS

We used linear risk regression models²⁶ to obtain estimates of the adjusted risk difference^{27,28} and negative binomial²⁹ regression models to obtain estimates of the rate-ratio effect attributable to 1 to 11 months or more than 11 months of deployment in Iraq or Afghanistan versus no deployment during the study period. We built models and performed analyses to identify variables that confounded or modified this relationship. A change in the estimate of 10% or greater indicated confounding.³⁰ Covariates included the age of the wife and her mental health history, as well as the total number of deployments in Iraq or Afghanistan and the rank and time in service of the military member. We decided a priori to include any outpatient mental health diagnoses in the 3 years before the study period in all models to control for mental health history. Because of the large sample, we used confidence intervals rather than P values to indicate meaningful differences.³¹ All data analyses were conducted with the use of SAS software, version 9.2 (SAS Institute).

The institutional review boards of the Gillings School of Global Public Health at the University of North Carolina at Chapel Hill and the Uniformed Services University of the Health Sciences approved the study protocol and waived the requirement for informed consent. All data were obtained from the Armed Forces Health Surveillance Center.

RESULTS

The sample included 6,585,224 outpatient visits by 250,626 wives, of whom 34.7% had at least one mental health diagnosis during the study period. Among women whose husbands were de-

ployed during the study period, 36.6% had at least one mental health diagnosis, as compared with 30.5% of women whose husbands were not deployed (Table 1). Depression, anxiety, sleep disorder, and acute stress reaction and adjustment disorder were the most common diagnoses in both groups, but the percentage of spouses with one or more diagnoses in these categories during the study period was lower among spouses of nondeployed personnel. More than two thirds of the Army service members were deployed during this time, to Iraq only (55.2%), Afghanistan only (6.8%), or both (7.0%). The remaining soldiers (31.0%) were not deployed. On average, spouses of deployed personnel were younger than spouses of personnel who were not deployed and had more outpatient visits during the study period; this was true of spouses with at least one mental health diagnosis and of spouses with no diagnosis (Table 1). Data on race or ethnic group were not available for more than half the study participants (52.7%). The mean and median number of months deployed did not vary appreciably according to race or ethnic group, nor was there evidence of confounding according to race or ethnic group in the adjusted models among persons for

Table 1. Mental Health Diagnoses in U.S. Army Wives According to the Deployment Status of Their Spouses, 2003–2006.*

Diagnosis	Spouse Deployed			Spouse Not Deployed		
	Wife with Diagnosis (N=172,568)	Age of Wife	Outpatient Visits by Wife†	Wife with Diagnosis (N=78,058)	Age of Wife	Outpatient Visits by Wife†
	no. (%)	yr	no.	no. (%)	yr	no.
Disorder						
Alcohol use	1,864 (1.1)	30.5±6.8	50.1±46.0	622 (0.8)	34.0±6.9	52.8±54.9
Anxiety	23,548 (13.6)	31.8±6.4	48.9±40.6	8,421 (10.8)	34.4±6.7	47.3±45.6
Bipolar disorder	4,224 (2.4)	31.0±6.3	62.3±50.9	1,594 (2.0)	33.3±6.7	63.3±57.6
Delirium, dementia, or other cognitive disorder	1,087 (0.6)	32.5±6.4	68.2±60.2	431 (0.6)	35.1±6.7	79.3±77.6
Depressive disorder	40,825 (23.7)	31.4±6.4	45.0±37.4	14,909 (19.1)	34.1±6.7	43.1±41.1
Dissociative disorder	75 (<0.1)	32.6±6.1	93.0±86.6	44 (0.1)	35.6±7.4	88.7±87.7
Drug use	1,827 (1.1)	30.8±6.7	73.4±70.6	647 (0.8)	34.3±6.7	73.2±73.2
Impulse control disorder	210 (0.1)	31.6±6.4	73.4±70.8	83 (0.1)	33.4±6.5	63.1±63.5
Pediatric behavioral disorder	266 (0.2)	31.2±6.6	50.5±38.7	121 (0.2)	32.7±6.7	67.0±62.9
Personality disorder	2,013 (1.2)	30.6±6.3	69.3±55.5	725 (0.9)	33.0±6.8	73.2±64.6
Psychotic disorder	2,180 (1.3)	31.7±6.5	61.6±52.5	891 (1.1)	34.5±6.7	65.3±71.4
Sleep disorder	14,720 (8.5)	32.6±6.6	51.8±43.2	5,176 (6.6)	35.5±6.6	53.5±50.5
Somatoform or factitious disorder	6,833 (4.0)	31.7±6.5	54.3±46.9	2,566 (3.3)	34.2±6.7	53.3±53.4
Stress disorder						
Acute stress reaction or adjustment disorder	15,703 (9.1)	31.6±6.3	48.5±39.3	5,086 (6.5)	34.0±6.6	47.4±46.1
Neurotic disorder	1,593 (0.9)	30.3±6.5	63.3±55.6	560 (0.7)	32.6±7.0	65.6±61.8
Post-traumatic stress disorder	2,331 (1.4)	31.3±6.4	65.5±52.7	896 (1.1)	33.4±6.4	67.6±58.2
Other	177 (0.1)	32.5±6.3	57.9±61.4	46 (0.1)	36.4±6.7	57.0±60.8
Composite findings						
Any diagnosis	63,091 (36.6)	31.6±6.5	41.4±34.8	23,799 (30.5)	34.3±6.7	39.5±38.5
No diagnosis	109,477 (63.4)	31.2±6.6	19.4±19.0	54,259 (69.5)	34.3±7.0	16.7±18.9
Total sample	172,568 (100.0)	31.3±6.6	27.5±28.0	78,058 (100.0)	34.3±6.9	23.6±28.5

* Plus–minus values are means ±SD.

† Numbers shown are the mean numbers of outpatient visits for any reason over the 4-year study period among women with one or more diagnoses in a given diagnostic category.

whom data were available. Race or ethnic group was excluded from the analysis, given the extent of missing data.

The age of the wife and the service member's total number of deployments to Iraq or Afghanistan also emerged as confounders of the relationship between spousal deployment and a mental health diagnosis, and these variables were included in all models. Risk-difference results are expressed as the number of excess cases of mental health diagnoses, attributable to 1 to 11 months or more than 11 months of deployment from 2003 to 2006, per 1000 wives of personnel deployed, with the use of spouses of personnel who were not deployed as the reference group. After adjustment, the number of excess cases for any mental health diagnosis was 41.3 (95% confidence interval [CI], 35.6 to 47.1) associated with deployment of 1 to 11 months and 60.7 (95% CI, 53.8 to 67.7) associated with deployment of more than 11 months. Among specific categories, notable effects were observed for depressive, sleep, anxiety, and acute stress and adjustment disorders (Table 2).

The rate of use of outpatient medical services associated with mental health diagnoses followed a similar pattern. Among spouses of military members who were deployed, as compared with spouses of those who were not deployed, the rates of diagnoses associated with 1 to 11 months and more than 11 months of deployment were 18 to 24% higher for depressive disorders, 21 to 40% higher for sleep disorders, 25 to 29% higher for anxiety disorders, and 23 to 39% higher for acute stress reaction and adjustment disorders. The rate of use of mental health services for any mental health diagnosis was 19% higher (rate ratio, 1.19; 95% CI, 1.15 to 1.22) among spouses of military members who were deployed for 1 to 11 months and 27% higher (rate ratio, 1.27; 95% CI, 1.22 to 1.32) among spouses of military members who were deployed for more than 11 months, as compared with spouses of military members who were not deployed during the 2003–2006 period (Table 2).

DISCUSSION

Our investigation of the association between mental health problems in military families and the current conflicts in Iraq and Afghanistan captures data for a substantial proportion of the nearly 300,000 active-duty Army spouses.³² Our

findings indicate that after adjustment for characteristics of the soldiers and spouses, prolonged periods of deployment for these operations were associated with an increased risk of mental health diagnoses and increased visits for these diagnoses among wives of Army soldiers. The increase in risk was most apparent for depressive, anxiety, sleep, and acute stress reaction and adjustment disorders. Risks and rates were not increased for disorders that would not be expected to vary according to deployment status (e.g., delirium, dementia, and other cognitive disorders). Overall, our data suggest that the mental health effects of current operations are extending beyond soldiers and into their immediate families.

Our use of administrative data was essential to obtain a high volume of records, but it meant that measures of mental health were in the form of diagnostic codes. Thus, we relied on assumptions of coding validity and reliability, in general, and on the use of codes by medical professionals, specifically. Reliance on these codes may represent an insensitive method of ascertaining current and past mental health status in this study. A potential diagnostic bias may also exist, since medical professionals would not necessarily be unaware of the soldier's deployment status. Neither issue could be addressed, given our retrospective design. Spouses who used medical benefits from civilian employers may have had diagnoses that were not included in our analyses, but it is unlikely that these effects would vary according to deployment status. For the half of the sample for which information about race or ethnic group was available, there were similarities in both the mean and median months deployed across racial and ethnic groups. In addition, adjusted effect estimates did not vary appreciably; this suggests that race or ethnic group did not confound the relationship between deployment status and mental health. However, the amount of missing data precluded a definitive analysis of potential bias. Previous research in civilian populations has shown racial and ethnic differences in attitudes toward seeking care for mental health services.³³ It is unknown whether this finding holds true for military populations.

Unfortunately, we did not have exact dates of deployment for soldiers, and we were therefore not able to assess the temporal relationship between deployment and a mental health diagnosis. In addition, our analysis did not include data on

Table 2. Adjusted Number of Mental Health Diagnoses Attributable to the Deployment of a Spouse and Adjusted Rate Ratio for the Number of Mental Health Visits.

Diagnostic Category	No. of Excess Cases per 1000 Wives (95% CI)	Rate Ratio (95% CI)*
Alcohol use		
Deployed 1–11 mo	1.1 (0.0 to 2.2)	0.99 (0.81 to 1.21)
Deployed >11 mo	3.1 (1.6 to 4.5)	1.10 (0.86 to 1.40)
Anxiety disorder		
Deployed 1–11 mo	15.7 (11.8 to 19.6)	1.25 (1.19 to 1.31)
Deployed >11 mo	18.7 (13.9 to 23.5)	1.29 (1.21 to 1.36)
Bipolar disorder		
Deployed 1–11 mo	0.4 (–1.1 to 1.8)	1.08 (0.94 to 1.24)
Deployed >11 mo	2.2 (0.3 to 4.2)	1.17 (0.99 to 1.39)
Delirium, dementia, or other cognitive disorder		
Deployed 1–11 mo	0.9 (–0.0 to 1.7)	1.28 (1.04 to 1.59)
Deployed >11 mo	1.1 (0.0 to 2.2)	1.08 (0.83 to 1.40)
Depressive disorder		
Deployed 1–11 mo	27.4 (22.4 to 32.3)	1.18 (1.13 to 1.23)
Deployed >11 mo	39.3 (33.2 to 45.4)	1.24 (1.18 to 1.31)
Dissociative disorder		
Deployed 1–11 mo	–0.1 (–0.3 to 0.2)	1.18 (0.46 to 3.01)
Deployed >11 mo	0.2 (–0.5 to 0.2)	0.82 (0.25 to 2.67)
Drug use		
Deployed 1–11 mo	0.8 (–0.3 to 1.9)	1.03 (0.86 to 1.24)
Deployed >11 mo	2.6 (1.2 to 4.0)	1.39 (1.11 to 1.73)
Impulse control disorder		
Deployed 1–11 mo	0.1 (–0.3 to 0.5)	1.65 (0.84 to 3.22)
Deployed >11 mo	0.1 (–0.4 to 0.6)	2.13 (0.89 to 5.09)
Pediatric behavioral disorder		
Deployed 1–11 mo	0.0 (–0.5 to 0.5)	0.97 (0.65 to 1.45)
Deployed >11 mo	0.1 (–0.5 to 0.7)	0.90 (0.56 to 1.45)
Personality disorder		
Deployed 1–11 mo	1.0 (–0.0 to 2.0)	1.37 (1.13 to 1.65)
Deployed >11 mo	2.1 (0.7 to 3.4)	1.62 (1.28 to 2.05)
Psychotic disorder		
Deployed 1–11 mo	0.1 (–1.1 to 1.4)	1.10 (0.93 to 1.30)
Deployed >11 mo	1.1 (–0.4 to 2.7)	1.23 (1.00 to 1.51)
Sleep disorder		
Deployed 1–11 mo	11.6 (8.3 to 14.8)	1.21 (1.14 to 1.28)
Deployed >11 mo	23.5 (19.4 to 27.6)	1.40 (1.31 to 1.50)
Somatoform or factitious disorder		
Deployed 1–11 mo	5.1 (2.7 to 7.4)	1.11 (1.03 to 1.20)
Deployed >11 mo	8.2 (5.3 to 11.1)	1.23 (1.12 to 1.35)

Table 2. (Continued.)

Diagnostic Category	No. of Excess Cases per 1000 Wives (95% CI)	Rate Ratio (95% CI)*
Stress disorder		
Acute stress reaction or adjustment disorder		
Deployed 1–11 mo	12.0 (8.6 to 15.4)	1.23 (1.15 to 1.31)
Deployed >11 mo	16.4 (12.2 to 20.6)	1.39 (1.28 to 1.50)
Neurotic disorder		
Deployed 1–11 mo	0.7 (–0.3 to 1.6)	1.09 (0.93 to 1.29)
Deployed >11 mo	1.9 (0.7 to 3.2)	1.33 (1.10 to 1.61)
Post-traumatic stress disorder		
Deployed 1–11 mo	0.5 (–0.7 to 1.7)	1.13 (0.94 to 1.36)
Deployed >11 mo	1.3 (–0.2 to 2.8)	1.28 (1.02 to 1.60)
Other		
Deployed 1–11 mo	0.3 (–0.1 to 0.6)	1.35 (0.83 to 2.18)
Deployed >11 mo	0.5 (–0.0 to 0.9)	1.89 (1.08 to 3.29)
Any mental health diagnosis		
Deployed 1–11 mo	41.3 (35.6 to 47.1)	1.19 (1.15 to 1.22)
Deployed >11 mo	60.7 (53.8 to 67.7)	1.27 (1.22 to 1.32)

* The rate ratio is the ratio of the number of visits within a diagnostic category per person per 4-year period (2003–2006) to the number of visits within the reference group (wives of personnel who were not deployed during the same period). The analysis was based on outpatient visits by 250,626 wives. Linear risk and negative binomial regression models were adjusted for the woman's age, the number of her spouse's deployments to Afghanistan or Iraq during the 2003–2006 period, and her status with respect to a history of any mental health diagnosis between 2000 and 2002.

the soldier's mental health, which could affect the spouse's knowledge and attitudes about psychiatric conditions and treatment. However, the stigma associated with seeking care for mental health concerns has been well documented among military personnel.^{2,34} Spouses may share these concerns about stigma and avoid seeking care, in which case our results would underestimate mental health problems in the military beneficiary population.

Similarly, it is possible that a person was prescribed medication to treat the symptoms of a mental health problem but was not assigned a corresponding diagnostic code. Since we did not include data on prescriptions, these persons would not be counted as having a mental health diagnosis. Still, such occurrences would underestimate the true incidence of mental health problems in the study population, and since they would not be expected to occur differentially according to the deployment status of soldiers, they are unlikely to have had an appreciable effect on

our results. Finally, we were unable to link specific deployment-related stressors to the increased risk of a mental health diagnosis or the use of mental health services; this limited our ability to characterize the effect of extended deployment on the mental health of spouses relative to other stressors they may have faced (e.g., a decline in physical health or loss of employment).

The exclusion of male spouses, persons with a spouse who had been in the military less than 5 years as of January 1, 2007, and spouses of Reserve and National Guard personnel limits the generalizability of our findings. Although adjustment for mental health history dictated the latter two exclusions, we believe the resulting estimates of excess use of mental health services are conservative. Spouses in our sample probably had at least 5 years of continuous Army life, whereas spouses of Reserve and National Guard soldiers may have missed substantial opportunities for networking, shared experience, and military services associated with life in and around most

active-duty communities. Nonetheless, family members of Reserve and National Guard members and persons new to military life constitute large and important groups with experiences that are worthy of research attention and with outcomes that may differ markedly from those in the current study.

Our findings have important public health implications. The 41.3 excess cases of any mental health diagnosis per 1000 wives, attributable to 1 to 11 months of deployment, translates into 3474 excess mental health diagnoses among spouses of 84,105 personnel deployed for this period. The 60.7 excess cases of any mental health diagnosis per 1000 wives attributable to more than 11 months of deployment translates into 5370 excess mental health diagnoses among spouses of 88,463 personnel. Because the majority of active-duty Army soldiers are married,³² and they and their families will eventually receive care outside the military medical system, both the short-term and long-term effects of these findings should be considered in planning programs and allocation of mental health resources

within the military community. Military leaders go to great lengths to offer services and support to families of deployed personnel, given the duration of and hazards associated with current operations. Such action has probably mitigated the effect of deployment on the mental health of family members. Greater attention is being paid to the mental health of returning veterans.³⁵⁻³⁷ Our findings provide support for increased efforts for mental health services for military family members.

Dr. Gaynes reports receiving consulting fees from Bristol-Myers Squibb and grant support from Bristol-Myers Squibb and Novartis and serving as an expert witness for Phillips Lytle in a case involving paroxetine, which did not go to trial. No other potential conflict of interest relevant to this article was reported.

The views expressed in this article are those of the authors and are not intended to represent the official policy or position of the Uniformed Services University of the Health Sciences, the Department of Defense, or any other U.S. government organization.

We thank Steven K. Tobler, M.D., M.P.H., Angelia A. Eick, Ph.D., and Jay L. Mansfield, M.A.S., of the Armed Forces Health Surveillance Center, and James D. Mancuso, M.D., M.P.H., of the Uniformed Services University of the Health Sciences, for assistance in data acquisition; Kwanhye Jung, M.S., for assistance in data management; Christopher A. Wiesen, Ph.D., for assistance in statistical programming; and David B. Sommer, M.D., M.P.H., for his comments on an earlier version of the manuscript.

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