

Prevalence of Mental Health Problems and Functional Impairment Among Active Component and National Guard Soldiers 3 and 12 Months Following Combat in Iraq

Jeffrey L. Thomas, PhD; Joshua E. Wilk, PhD; Lyndon A. Riviere, PhD; Dennis McGurk, PhD; Carl A. Castro, PhD; Charles W. Hoge, MD

Context: A growing body of literature has demonstrated the association of combat in Iraq and Afghanistan with postdeployment mental health problems, particularly posttraumatic stress disorder (PTSD) and depression. However, studies have shown varying prevalence rates of these disorders based on different case definitions and have not assessed functional impairment, alcohol misuse, or aggressive behavior as comorbid factors occurring with PTSD and depression.

Objectives: To (1) examine the prevalence rates of depression and PTSD using several case definitions including functional impairment, (2) determine the comorbidity of alcohol misuse or aggressive behaviors with depression or PTSD, and (3) compare rates between Active Component and National Guard soldiers at the 3- and 12-month time points following their deployment to Iraq.

Design: Population-based, cross-sectional study.

Setting: United States Army posts and National Guard armories.

Participants: A total of 18 305 US Army soldiers from 4 Active Component and 2 National Guard infantry brigade combat teams.

Interventions: Between 2004 and 2007, anonymous mental health surveys were collected at 3 and 12 months following deployment.

Main Outcome Measures: Current PTSD, depression, functional impairment, alcohol misuse, and aggressive behavior.

Results: Prevalence rates for PTSD or depression with serious functional impairment ranged between 8.5% and 14.0%, with some impairment between 23.2% and 31.1%. Alcohol misuse or aggressive behavior comorbidity was present in approximately half of the cases. Rates remained stable for the Active Component soldiers but increased across all case definitions from the 3- to 12-month time point for National Guard soldiers.

Conclusions: The prevalence rates of PTSD and depression after returning from combat ranged from 9% to 31% depending on the level of functional impairment reported. The high comorbidity with alcohol misuse and aggression highlights the need for comprehensive postdeployment screening. Persistent or increased prevalence rates at 12 months compared with 3 months postdeployment illustrate the persistent effects of war zone service and provide important data to guide postdeployment care.

Arch Gen Psychiatry. 2010;67(6):614-623

TWO LONGITUDINAL STUDIES of veterans of Operational Iraqi Freedom (OIF) and Operational Enduring Freedom (OEF) have shown that the incidence of posttraumatic stress disorder (PTSD) is 2 to 3 times higher among those exposed to combat compared with those who did not report significant combat exposure.^{1,2} These studies add to growing cross-sectional evidence linking combat duty in Iraq and Afghanistan to the development of postdeployment health problems including PTSD, depression, anxiety, and symptoms attributed to mild traumatic brain injury.³⁻⁷

Despite the strong association between combat and mental health problems, prevalence rates between studies have varied widely, most likely owing to differences in levels of combat exposure and to the case definitions used. Studies that use structured clinical interviews are costly and difficult to conduct with working infantry units, and most large studies of OIF or OEF combat veterans have relied on standardized self-report symptom scales, particularly the PTSD Checklist (PCL), which can be scored in several ways.⁸ To our knowledge, functional impairment measures have not been incorporated into any case definitions. The lack

Author Affiliations are listed at the end of this article.

of consistent definitions and functional impairment measures has made it difficult to determine the true effects of combat service in Iraq and Afghanistan or accurately project mental health service needs.

This study examines the prevalence rates of depression and PTSD in a large group of infantry soldiers at the 3- and 12-month time points following their deployment using several different case definitions including a measure of functional impairment. The study also evaluates alcohol misuse and aggressive behaviors, 2 comorbid conditions commonly reported in veteran populations.⁹⁻¹¹

In addition, this study provides a unique look at differences between Active Component and National Guard soldiers. While Active Component soldiers have a federal mission to provide full-time military support for the defense of the nation, National Guard soldiers are part of the Reserve Component and primarily have a state mission to provide support to the community as citizen soldiers. During wartime, however, National Guard units can be federally mobilized to active duty to participate in direct combat operations in the same role as Active Component infantry brigade combat teams (BCTs); they have played a central role in OIF and OEF. Although approximately one-third of service members deployed to OIF/OEF have come from Reserve Component units, there is little research on the effect of OIF/OEF deployment by component.^{4,12}

METHODS

DATA SOURCE

Between 2004 and 2007, we collected 18 305 anonymous surveys from members of 4 Active Component and 2 National Guard BCTs at 3 and 12 months postdeployment. Of the 18 305 surveys received, 13 226 were from veterans of OIF and were used for analysis. Our study extends a previous cross-sectional study conducted 3 to 4 months postdeployment³ by increasing the sample size and adding a second cross-sectional evaluation of the same units at 12 months postdeployment. The 3-month time point was chosen based on research that found that assessing mental health 3 to 4 months postdeployment is optimal.¹³ The follow-up 12-month period was selected because it is the latest time that would ensure maximal participation without interfering with preparations for subsequent deployment. It is important to note that these units are not intended to be representative of all deploying military personnel but rather typical combat maneuver units of similar structure and function that were known to be at high risk owing to their mission to conduct ground combat operations. The 13 226 surveys used for analysis were obtained from 4933 soldiers from 4 Active Component BCTs at 3 to 4 months postdeployment; 4024 soldiers from these BCTs at 12 months postdeployment; 2684 soldiers from 2 National Guard BCTs at 3 to 4 months postdeployment; and 1585 soldiers from the same National Guard BCTs at the 12-month time point.

RECRUITMENT AND REPRESENTATIVENESS

The data were collected under a protocol approved by the Walter Reed Army Institute of Research institutional review board using procedures previously described.³ Recruitment briefings were scheduled at the convenience of the units, close to their work location. From the 6 participating BCTs, a combined total of approximately 29 460 soldiers were determined

to be present in the units at the 2 time points based on information provided by unit personnel staff. Thus, the overall response rate was 62% (18 305 of 29 460 soldiers). This number is consistent with other research that used large population-based surveys and similar procedures.^{3,7,14,15} Most nonparticipation was related to not attending the recruitment briefings. At each data collection, research personnel conferred with the unit leadership and medical personnel to ensure that there were no systematic reasons that soldiers were not available to attend the briefings on the scheduled days. Reasons for unavailability included other duty or training obligations, medical appointments, illness, or unscheduled or personal leave.

In addition to determining the overall response rate in the units, the participation (consent) rate was calculated for soldiers who attended the recruitment briefing. Completion of any part of the paper-and-pencil survey was considered a response. The participation rate was 97% overall, ranging from 94% to 99% for all 12 data collections. Missing data on the surveys ranged from 2% to 10%; there was an average 2% of values missing for the combat exposure items, 2% for the PTSD items, 5% for the depression items, 7% for the aggression items, and 10% for the alcohol items. Finally, to assess the representativeness of our sample, we compared the demographics of soldiers from our sample to the demographic characteristics of all Active Component and National Guard OIF veterans with a combat occupational specialty. Demographics of OIF veterans were compiled from Post-Deployment Health Assessments from Army personnel obtained after their return from Iraq using the Defense Medical Surveillance System database (**Table 1**).

SURVEY MEASURES

Demographics and Combat Exposure Levels

Demographic measures included component, age, sex, race/ethnic group, education level, rank, and marital status (Table 1). A combat events checklist measured whether each event had occurred at least once during deployment (**Table 2**).

Posttraumatic Stress Disorder

We examined 7 case definitions of PTSD defined in **Table 3**. Posttraumatic stress disorder was measured using the 17-item PCL,⁸ well-validated in civilian and military primary care and mental health settings.^{8,16,17} The PCL is usually scored by summing the answers to the 17 questions (range, 17-85); a stringent cutoff of 50 or higher has been most widely used in military populations. The 7 definitions ranged from broad (liberal) to strict (conservative), based on *DSM-IV* B, C, and D symptom criteria, a high symptom severity cutoff score (≥ 50), and/or endorsement of functional impairment.^{8,16,18}

Depression

We examined 3 case definitions of depression defined in Table 3. Depression was measured with the 9-item Patient Health Questionnaire (PHQ-9), a well-validated clinical scale for depression based on the *DSM-IV* criteria that is widely used in primary care and specialty mental health settings.¹⁸⁻²⁰

Functional Impairment

Functional impairment due to depression was measured using the single item from the PHQ-9 that asks, "If you checked off any of the problems above, how difficult have these problems made it for you to do your work, take care of things at home, or get along with

Table 1. Demographics

Characteristics	Postdeployment, No. (%)					
	Active Component		National Guard		Active Component PDHA (n=128 742) ^a	National Guard PDHA (n=50 585) ^a
	3 mo (n=4933)	12 mo (n=4024)	3 mo (n=2684)	12 mo (n=1585)		
Age, y						
18-24	2740 (56)	1908 (48)	871 (33)	431 (27)	59 511 (46)	15 490 (31)
25-29	1188 (24)	1083 (27)	513 (19)	333 (21)	33 796 (26)	10 765 (21)
30-39	903 (18)	907 (23)	787 (30)	492 (31)	28 413 (22)	15 244 (30)
≥40	93 (2)	115 (3)	493 (19)	323 (21)	7022 (5)	9086 (18)
Sex						
Male	4801 (98)	3876 (97)	2516 (95)	1494 (95)	127 910 (99)	50 342 (99)
Female	114 (2)	136 (3)	136 (5)	81 (5)	832 (1)	242 (1)
Race/ethnic group ^b						
White	3257 (67)	2338 (59)	1062 (68)	1069 (68)	92 895 (72)	39 985 (79)
Black	708 (15)	932 (23)	386 (25)	411 (26)	13 951 (11)	3776 (8)
Hispanic	550 (11)	431 (11)	58 (4)	30 (2)	13 337 (11)	3759 (7)
Other	366 (8)	280 (7)	61 (4)	59 (4)	8559 (7)	3065 (6)
Education ^c						
≤High school graduate	4360 (90)	3643 (92)	1371 (88)	691 (86)	104 059 (85)	42 593 (84)
College graduate	501 (10)	318 (8)	197 (13)	108 (14)	19 115 (15)	7925 (16)
Military rank ^d						
Junior enlisted	2959 (60)	2050 (52)	1383 (52)	661 (42)	59 824 (47)	23 295 (46)
Junior noncommissioned	1381 (28)	1505 (38)	943 (36)	640 (41)	40 357 (31)	17 195 (34)
Senior noncommissioned	214 (4)	222 (6)	186 (7)	143 (9)	9814 (8)	3740 (7)
Officer	355 (7)	203 (5)	134 (5)	127 (8)	18 745 (15)	6355 (13)
Marital status						
Single	2208 (51)	1395 (41)	1079 (43)	579 (41)	65 870 (51)	23 713 (47)
Married	2148 (49)	1993 (59)	1427 (57)	852 (60)	62 817 (49)	26 872 (53)

^aPopulation reference group: army veterans of Operation Iraqi Freedom in combat occupation who responded to the Post-Deployment Health Assessment (PDHA), a medical screening conducted immediately postdeployment of returned soldiers. Post-Deployment Health Assessment data were collected from April 2, 2003, to June 18, 2008, and retrieved June 30, 2008.

^bItems not asked on a 3-month survey of a National Guard unit.

^cItems not asked on 3- and 12-month surveys of a National Guard unit.

^dMilitary ranks: junior enlisted are considered the ranks E1 to E4 (Private to Specialist); junior noncommissioned, E5 and E6 (Sergeant and Staff Sergeant); senior noncommissioned, E7 to E9 (Sergeant First Class to Sergeant Major); and officers, O1 and above. In a Brigade Combat Team, officers' ranks range from O1 to O6, Second Lieutenant to 1 Colonel (the Commander).

Table 2. Combat Experiences

Combat Experiences	Persons Who Experienced Event at Least Once During Deployment by Time After Deployment, No./Total (%)			
	Active Component		National Guard	
	3 mo	12 mo	3 mo	12 mo
Being attacked or ambushed	4437/4894 (91)	3402/3976 (86)	2168/2657 (82)	1247/1563 (80)
Receiving incoming artillery, rocket, or mortar fire	4529/4865 (93)	3444/3925 (88)	2474/2650 (93)	1428/1552 (92)
Receiving small arms fire	4354/4848 (90)	3440/3932 (88)	2115/2637 (80)	1253/1535 (82)
Shooting or directing fire at the enemy	3406/4872 (70)	2757/3930 (70)	1653/2647 (62)	996/1554 (64)
Being responsible for the death of an enemy combatant	1830/4822 (38)	1626/3898 (42)	634/2627 (24)	459/1533 (30)
Being responsible for the death of a noncombatant	501/4845 (10)	506/3925 (13)	142/2647 (5)	131/1555 (8)
Seeing dead bodies or human remains	4107/4565 (84)	3358/3942 (85)	2066/2637 (78)	1258/1548 (81)
Handling or uncovering human remains	2124/4851 (44)	1896/3918 (48)	1127/2630 (43)	734/1536 (48)
Seeing dead or seriously injured Americans	3518/4888 (72)	2725/3950 (69)	1899/2653 (72)	1168/1557 (75)
Knowing someone seriously injured or killed	4244/4875 (87)	3247/3947 (82)	2347/2658 (88)	1357/1556 (87)
Seeing ill or injured women or children whom you were unable to help	3023/4865 (62)	2258/3933 (57)	1266/2639 (48)	754/1552 (49)
Being wounded or injured	872/4861 (18)	717/3928 (18)	552/2646 (21)	369/1554 (24)
Had a close call, was shot or hit, but protective gear saved you	600/4881 (12)	615/3935 (16)	487/2644 (18)	325/1554 (21)
Had a buddy shot or hit who was near you	1270/4871 (26)	1080/3926 (28)	696/2644 (26)	461/1559 (30)
Clearing or searching homes or buildings	3722/4884 (76)	2696/3829 (69)	1654/2648 (63)	972/1557 (62)
Engaging in hand-to-hand combat	963/4868 (20)	677/3952 (17)	237/2646 (9)	215/1559 (14)
Saved the life of soldier or civilian	931/4802 (19)	852/3886 (22)	500/2615 (19)	344/1542 (22)

Table 3. Case Definitions of Depression and PTSD

Measure	Specific Case Definition
Depression	
PHQ, <i>DSM-IV</i> with no functional impairment ^a	Respondent endorses at least 5 symptoms according to <i>DSM-IV</i> including “feeling down, depressed or hopeless” or “having little interest in doing things” for more than half of the days in the past month
PHQ, <i>DSM-IV</i> with some functional impairment ^a	Respondent endorses at least 5 symptoms according to <i>DSM-IV</i> including “feeling down, depressed or hopeless” or “having little interest in doing things for more than half the days in the past month” and also expresses that these problems have made it at least somewhat difficult to do their work, take care of things at home, or get along with other people
PHQ, <i>DSM-IV</i> with serious functional impairment ^a	Respondent endorses at least 5 symptoms according to <i>DSM-IV</i> including “feeling down, depressed or hopeless” or “having little interest in doing things for more than half the days in the past month” and expresses that these problems have made it very or extremely difficult to do their work, take care of things at home, or get along with other people
PTSD	
PCL, <i>DSM-IV</i>	Respondent endorses the B, C, and D criteria: at least 1 reexperienced symptom (eg, nightmares), at least 3 avoidance or numbing symptoms (eg, avoiding things that remind them of the situation), and at least 2 symptoms of hyperarousal (eg, being easily startled) at the moderate or higher level
PCL, score ≥ 50	Respondent’s PCL score sums to ≥ 50
PCL, <i>DSM-IV</i> and score ≥ 50	Respondent endorses <i>DSM-IV</i> symptom cluster and scores ≥ 50 on PCL
PCL, <i>DSM-IV</i> with some functional impairment	Respondent endorses <i>DSM-IV</i> symptom cluster and reports that symptoms of the disorder have made it at least somewhat difficult to do their work, take care of things at home, or get along with other people
PCL, <i>DSM-IV</i> with serious functional impairment	Respondent endorses <i>DSM-IV</i> symptom cluster and reports that symptoms of the disorder have made it very or extremely difficult to do their work, take care of things at home, or get along with other people
PCL, <i>DSM-IV</i> and score ≥ 50 with some functional impairment	Respondent endorses <i>DSM-IV</i> symptom cluster, scores ≥ 50 on PCL, and endorses that these problems have made it at least somewhat difficult to do their work, take care of things at home, or get along with other people
PCL, <i>DSM-IV</i> and score ≥ 50 with serious functional impairment	Respondent endorses <i>DSM-IV</i> symptom cluster, scores ≥ 50 on PCL, and endorses that these problems have made it very or extremely difficult to do their work, take care of things at home, or get along with other people
Depression or PTSD	
PHQ, <i>DSM-IV</i> or PCL, <i>DSM-IV</i>	Respondent endorses PHQ <i>DSM-IV</i> items or endorses PCL <i>DSM-IV</i> symptom cluster
PHQ, <i>DSM-IV</i> or PCL, <i>DSM-IV</i> and score ≥ 50	Respondent endorses PHQ <i>DSM-IV</i> items or endorses PCL <i>DSM-IV</i> symptom cluster plus a score of ≥ 50
PHQ, <i>DSM-IV</i> with some functional impairment; PCL, <i>DSM-IV</i> with some functional impairment	(1) Respondent endorses PHQ <i>DSM-IV</i> items and reports that symptoms of the disorder have made it somewhat difficult to do their work, take care of things at home, or get along with other people or (2) respondent endorses PCL <i>DSM-IV</i> symptom cluster and reports that symptoms of the disorder have made it somewhat difficult to do their work, take care of things at home, or get along with other people
PHQ, <i>DSM-IV</i> with serious functional impairment; or PCL, <i>DSM-IV</i> with serious functional impairment	(1) Respondent endorses PHQ <i>DSM-IV</i> items and reports that symptoms of the disorder have made it very or extremely difficult to do their work, take care of things at home, or get along with other people or (2) respondent endorses PCL <i>DSM-IV</i> symptom cluster and reports that symptoms of the disorder have made it very or extremely difficult to do their work, take care of things at home, or get along with other people

Abbreviations: PCL, PTSD checklist; PHQ, Patient Health Questionnaire; PTSD, posttraumatic stress disorder.

^aIf respondent endorses self-harm for a few or several days, a positive screen is also indicated.

other people?” This question has been shown to have acceptable correlations with standard measures of functional impairment and to be predictive of those with a depression diagnosis.¹⁹ To vary specificity and remain consistent with other studies in civilian and military populations,^{3,20} responses of “somewhat difficult” were considered to indicate some impairment²⁰ and responses of “very difficult” or “extremely difficult” were considered to indicate serious impairment.²⁰ Because the PCL lacks any measure of functional impairment and the single functional impairment question has been used with both the PHQ-9 and PHQ generalized anxiety scale,²¹ the same question was added below the 17 PCL questions.

Alcohol Misuse

Soldiers were asked 2 yes/no screening questions about their alcohol use using a validated measure widely used in primary care,²² postdeployment screening,^{6,15,23} and in a predeploy-

ment sample.³ The questions asked, in the past 4 weeks, “Have you felt you wanted or needed to cut down on your drinking?” and “Have you used alcohol more than you meant to?” A “yes” endorsement on either item was considered a positive screening for alcohol misuse.

Aggressive Behaviors

Because anger and aggression are frequently reported among combat veterans,^{10,11} we asked soldiers to indicate how often in the past month they “got angry with someone and kicked or smashed something, slammed the door, punched the wall, etc,” “threatened someone with physical violence,” or “got into a fight with someone and hit the person.” These questions were based on previous research that demonstrated a strong association between combat exposure and these items as well as other risk-taking behaviors.¹¹ Endorsement of any

of the items 1 or more times in the past month was an indicator of aggressive behavior. When investigating the comorbidity of aggressive behavior with depression and PTSD, we used only the most specific item, "got into a fight with someone and hit the person," as evidence of aggressive behavior. Although there are no published baseline comparisons, this item on fighting was used in the predeployment infantry sample included in Hoge and colleagues' study³; in that sample, 11.2% of soldiers endorsed this item.

QUALITY CONTROL PROCEDURES AND STATISTICAL ANALYSES

Surveys were optically scanned using the Scan Tools software package (Pearson Assessments Inc, Bloomington, Minnesota). Protocol quality control procedures stipulated that 10% of the surveys were randomly chosen and checked for scanning errors in all fields. The overall scanning error rate was 0.24% of all fields, a 99.76% accuracy rate.

The SPSS software (version 15.0; SPSS Inc, Chicago, Illinois) was used for analyses. Analyses included simple frequency and descriptive statistics, χ^2 tests of association, and logistic regression analysis. Logistic regression was used to determine whether differences observed from the 3- and 12-month time points were significant in both the Active and National Guard groups while controlling for rank, marital status, and combat exposure, and to determine if changes in the prevalence rates from the 3- to 12-month time points differed between the Active Component and National Guard participants.

RESULTS

Table 1 displays the demographic characteristics for Active Component and National Guard soldiers at the 3- and 12-month time points following deployment. The demographic characteristics of personnel who took part in the study at the 3- and 12-month time points were similar to the reference population demographics of OIF combat veterans in both the Active Component and the National Guard. There were slight differences between the 3- and 12-month time points on rank, age, and marital status. Within a year of returning from deployment, it is common for soldiers to get promoted or married, so these were not unexpected. The demographic characteristics of the study groups were similar to those of the general reference population, except that officers were undersampled, resulting in lower rank and age distributions than in the reference groups. This is likely because officers were less available owing to work-related duties. Additionally, National Guard participants included a higher percentage of African American respondents than the reference group. This may be because the 2 National Guard BCTs are from states with a higher proportion of African American individuals than the reference group, which represented 50 states. Rates of combat exposure were similar to rates reported elsewhere.^{3,24} Active Component and National Guard participants reported similar rates of exposure (Table 2).

Estimated PTSD prevalence based on *DSM-IV* symptom criteria ranged from 20.7% (Active Component, 3-month time point) to 30.5% (National Guard, 12-month time point). Most of these soldiers reported func-

tional impairment at the "somewhat difficult" level, and a relatively high percentage reported serious impairment ("very difficult" or "extremely difficult" level). For example, PTSD rates based on *DSM-IV* criteria and serious functional impairment were 7.7% for the Active Component at 3 months and 8.9% at 12 months and 6.7% for the National Guard at 3 months and 12.4% at 12 months. More than 6% of the soldiers (and up to 11% of National Guard soldiers at 12 months) met the most stringent case criteria defined by the *DSM-IV* plus a high level of symptoms (PCL score, ≥ 50) and serious functional impairment.

For depression, estimated prevalence rates ranged from 11.5% (National Guard, 3-month time point) to 16.0% (Active Component, 3-month time point) using the PHQ definition alone. When using the PHQ definition plus serious functional impairment, rates were 8.3% and 8.5% for the Active Component (3- and 12-month time points) and 5.0% and 7.3%, respectively, for the National Guard. The estimated prevalence of either depression or PTSD based on the *DSM-IV* and using a high-specificity cutoff (PCL score, >50) ranged from 21.8% to 22.8% for Active Component (3 and 12 months) and 18.7% to 27.8% for National Guard soldiers, with most reporting some functional impairment. Prevalence rates for PTSD or depression with serious functional impairment ranged from 11.1% to 12.3% for Active Component and 8.5% to 14.0% for National Guard soldiers at 3 and 12 months, respectively.

COMPONENT DIFFERENCES FROM THE 3- TO 12-MONTH TIME POINT

Estimated prevalence rates of depression, PTSD, or the combination of PTSD or depression between the 3- and 12-month time points reveal a clear pattern across case definitions (Table 4).

(1) Symptoms of PTSD increased significantly in both groups but with much larger increases observed in National Guard participants. The Active Component group showed increased prevalence rates on 4 of the 7 PTSD diagnostic criteria: PTSD according to *DSM-IV* (broad); PTSD according to *DSM-IV* with some functional impairment; PTSD according to *DSM-IV* and a PCL score of 50 or higher with some functional impairment; and PTSD according to *DSM-IV* and a PCL score of 50 or higher with serious functional impairment. In the National Guard group there were significant increases from the 3- to the 12-month time point on all 7 case definitions of PTSD. (2) Estimated prevalence rates for depression symptoms increased significantly from the 3- to 12-month time points across all case definitions in the National Guard group only. (3) Estimated prevalence rates for PTSD or depression case definitions increased significantly from the 3- to 12-month time points for both the Active Component and National Guard groups on all 4 defined criteria. (4) The magnitude of the increase between 3 and 12 months was greater for the National Guard than for the Active Component group for several outcomes using logistic regression models that included a time-component interaction (Table 4). If the interac-

Table 4. Mental Health Problems

Variable	Active Component			National Guard			P Value ^b
	Postdeployment, No./Total (%)		OR (95% CI) ^a	Postdeployment, No./Total (%)		OR (95% CI) ^a	
	3 mo (n=4933)	12 mo (n=4024)		3 mo (n=2684)	12 mo (n=1585)		
Depression							
Depression according to PHQ (no functional impairment)	757/4723 (16.0)	588/3749 (15.7)	1.04 (0.91-1.18)	299/2607 (11.5)	238/1501 (15.9)	1.53 (1.26-1.86) ^c	.001 ^d
Depression according to PHQ (some functional impairment)	694/4723 (14.7)	540/3749 (14.4)	1.06 (0.93-1.21)	264/2607 (10.1)	206/1501 (13.7)	1.49 (1.21-1.82) ^c	.003 ^d
Depression according to PHQ (serious functional impairment)	390/4723 (8.3)	320/3749 (8.5)	1.15 (0.97-1.36)	131/2607 (5.0)	110/1501 (7.3)	1.63 (1.24-2.15) ^c	.03 ^d
PTSD							
PTSD according to <i>DSM-IV</i> (broad definition)	1021/4933 (20.7)	954/4024 (23.7)	1.34 (1.20-1.51) ^c	576/2684 (21.5)	484/1585 (30.5)	1.64 (1.40-1.91) ^c	.02 ^d
PTSD according to PCL high-specificity cutoff score (≥ 50)	778/4899 (15.9)	693/3963 (17.5)	1.22 (1.07-1.39)	424/2661 (15.9)	400/1564 (25.6)	1.84 (1.55-2.19) ^c	<.001 ^d
PTSD according to <i>DSM-IV</i> and a high PCL cutoff score (≥ 50) (strict definition)	724/4899 (14.8)	656/3963 (16.6)	1.24 (1.08-1.41)	392/2661 (14.7)	384/1564 (24.6)	1.90 (1.60-2.26) ^c	<.001 ^d
PTSD according to <i>DSM-IV</i> (some functional impairment)	994/4899 (20.3)	928/3963 (23.4)	1.31 (1.17-1.47) ^c	569/2661 (21.4)	460/1564 (29.4)	1.54 (1.31-1.80) ^c	.06
PTSD according to <i>DSM-IV</i> (serious functional impairment)	377/4899 (7.7)	353/3963 (8.9)	1.25 (1.06-1.49)	178/2661 (6.7)	194/1564 (12.4)	2.11 (1.67-2.67) ^c	<.001 ^d
PTSD according to <i>DSM-IV</i> and a high PCL cutoff score (≥ 50) (some functional impairment)	619/4899 (12.6)	580/3963 (14.6)	1.28 (1.11-1.47) ^c	364/2661 (13.7)	354/1564 (22.6)	1.88 (1.57-2.25) ^c	<.001 ^d
PTSD according to <i>DSM-IV</i> and a high PCL cutoff score (≥ 50) (serious functional impairment)	310/4899 (6.3)	291/3963 (7.3)	1.24 (1.03-1.50) ^c	150/2661 (5.6)	176/1564 (11.3)	2.21 (1.72-2.84) ^c	<.001 ^d
Depression or PTSD							
Depression according to PHQ or PTSD according to <i>DSM-IV</i>	1295/4933 (26.3)	1142/4024 (28.4)	1.24 (1.12-1.38) ^c	653/2684 (24.3)	526/1585 (33.2)	1.58 (1.36-1.83) ^c	.006 ^d
Depression according to PHQ or PTSD according to <i>DSM-IV</i> and PCL high-specificity cutoff score (≥ 50)	1075/4933 (21.8)	918/4024 (22.8)	1.16 (1.04-1.30) ^c	502/2684 (18.7)	441/1585 (27.8)	1.71 (1.46-2.01) ^c	<.001 ^d
Depression according to PHQ (some functional impairment) or PTSD according to <i>DSM-IV</i> (some functional impairment)	1236/4933 (25.1)	1087/4024 (27.0)	1.22 (1.09-1.35) ^c	622/2684 (23.2)	493/1585 (31.1)	1.52 (1.31-1.77) ^c	.008 ^d
Depression according to PHQ (serious functional impairment) or PTSD according to <i>DSM-IV</i> (serious functional impairment)	547/4933 (11.1)	293/4024 (12.3)	1.22 (1.06-1.42) ^c	229/2684 (8.5)	222/1585 (14.0)	1.88 (1.52-2.33) ^c	.001 ^d

Abbreviations: CI, confidence interval; OR, odds ratio; PCL, PTSD checklist; PHQ, Patient Health Questionnaire; PTSD, posttraumatic stress disorder.

^aOR (95% CI) for 12 months compared with 3 months.

^bTime \times component interaction using logistic regression, controlling for rank, marital status, combat exposure, and the time and component main effects.

^cThe 3- and 12-month differences remained significant at $P < .05$ after controlling for rank, marital status, and combat exposure using logistic regression.

^dThe time \times component interaction was significant at $P < .05$.

tion term was significant ($P < .05$), the magnitude of the change from 3 to 12 months for the National Guard group was significantly greater than the magnitude of the change for the Active Component group. In summary, depression and/or PTSD symptoms increased significantly in the National Guard from the 3- to 12-month time points across all case definitions, whereas in the Active Component, depression symptoms remained stable and PTSD symptoms increased across several criteria.

We also examined rates of alcohol misuse and aggressive behaviors (**Table 5**). We found a significant increase from the 3- to 12-month time point for National Guard soldiers in aggressive behaviors (ie, threatening someone with physical violence and getting into a fight and hitting the person). The prevalence rates of depression or PTSD with accompanying alcohol misuse or ag-

gressive behavior were 9.7% and 14.7% for the 3- and 12-month time points, respectively, in the National Guard group. Using the most stringent criteria for a combination of depression or PTSD, serious functional impairment, and either alcohol misuse or aggressive behavior, the rates were 4.2% and 8.0%, respectively, for the 3- and 12-month time points in the National Guard group. The National Guard sample had higher prevalence rates across all combined criteria at the 12-month time point.

There were no significant changes from 3 to 12 months in the Active Component group for alcohol misuse or aggressive behaviors. A component effect was found; the magnitude of the increase on all comorbid criteria from the 3- to 12-month time points was significantly different for the National Guard compared with Active Component soldiers.

Table 5. Comorbidity of Alcohol Misuse or Aggression With Depression or PTSD

Variable	Active Component			National Guard			P Value ^b
	Postdeployment, No./Total (%)			Postdeployment, No./Total (%)			
	3 mo (n=4933)	12 mo (n=4024)	OR (95% CI) ^a	3 mo (n=2684)	12 mo (n=1585)	OR (95% CI) ^a	
Other Problem Behaviors							
Alcohol misuse ^c	575/4639 (12.4)	365/3698 (9.9)	0.90 (0.77-1.05)	332/2294 (14.5)	206/1370 (15.0)	1.04 (0.85-1.27)	.2
Get angry with someone and kick, smash, or punch something	1981/4595 (43.1)	1451/3642 (39.8)	0.98 (0.90-1.08)	978/2588 (37.8)	580/1490 (38.9)	1.05 (0.91-1.21)	.29
Threaten someone with physical violence	1719/4586 (37.5)	1285/3635 (35.4)	1.07 (0.97-1.19)	787/2581 (30.5)	500/1489 (33.6)	1.19 (1.02-1.38) ^d	.2
Get into a fight with someone and hit the person	813/4587 (17.7)	672/3647 (18.4)	1.28 (1.13-1.45) ^d	368/2581 (14.3)	260/1489 (17.5)	1.33 (1.09-1.62) ^d	.92
Depression or PTSD With Alcohol Misuse or Aggression							
Depression or PTSD (DSM) with alcohol misuse or fighting ^e	532/4933 (10.8)	443/4024 (11.0)	1.24 (1.07-1.44) ^d	260/2684 (9.7)	233/1585 (14.7)	1.71 (1.39-2.11) ^d	.008 ^f
Depression or PTSD (DSM, PCL score ≥50) with alcohol misuse or fighting ^g	471/4933 (9.5)	367/4024 (9.1)	1.13 (0.96-1.32)	213/2684 (7.9)	214/1585 (13.5)	1.93 (1.55-2.41) ^d	<.001 ^f
Depression (some functional impairment) or PTSD (some functional impairment) with alcohol misuse or fighting ^h	495/4933 (10.0)	421/4024 (10.5)	1.14 (0.98-1.32)	248/2684 (9.2)	215/1585 (13.6)	1.70 (1.38-2.09) ^d	.02 ^f
Depression (serious functional impairment) or PTSD (serious functional impairment) with alcohol misuse or fighting ⁱ	251/4933 (5.1)	212/4024 (5.3)	1.19 (0.96-1.46)	114/2684 (4.2)	127/1585 (8.0)	2.14 (1.61-2.85) ^d	.001 ^f

Abbreviations: CI, confidence interval; OR, odds ratio; PCL, PTSD checklist; PHQ, Patient Health Questionnaire; PTSD, posttraumatic stress disorder.

^aOR (95% CI) for 12 months compared with 3 months.

^bTime × component interaction using logistic regression, controlling for rank, marital status, combat exposure, and the time and component main effects.

^cModified Two-Item Conjoint Screen for Alcohol Misuse (TICS).

^dThe 3- and 12-month differences remained significant at $P < .05$ after controlling for rank, marital status, and combat exposure using logistic regression.

^eDepression according to PHQ or PTSD according to DSM-IV and fighting or TICS.

^fThe time × component interaction was significant at $P < .05$.

^gDepression according to PHQ or PTSD according to DSM-IV and PCL high specificity cutoff score (≥50) and fighting or TICS.

^hDepression according to PHQ (some functional impairment) or PTSD according to DSM-IV and PCL high-specificity cutoff score (≥50; some functional impairment) and fighting or TICS.

ⁱDepression according to PHQ (serious functional impairment) or PTSD according to DSM-IV and PCL high-specificity cutoff score (≥50; serious functional impairment) and fighting or TICS.

COMMENT

The 3 objectives of the study, focused on delineating the broad mental health effects of combat deployment during the first year after return from Iraq, were to (1) examine the prevalence rates of depression and PTSD using several case definitions, with the addition of functional impairment, (2) examine the comorbidity of alcohol misuse or aggression behaviors with depression or PTSD, and (3) compare prevalence rates between Active Component and National Guard study groups.

Available data from deploying military samples indicate that the expected baseline (predeployment) rates of PTSD and depression are comparable with large population samples such as those found in the National Co-

morbidity Study.^{1-3,25} The baseline PTSD prevalence ranges from 3% to 5% (defined using the DSM definition combined with a PCL score ≥50); depression rates are also in the same range (3%-5%). It has been estimated that 9.3% of soldiers have either PTSD, depression, or generalized anxiety symptoms before deployment.³

Using the least stringent definition, we observed PTSD rates across Active Component and National Guard study groups, study time points ranging from 20.7% to 30.5%, and depression rates ranging from 11.5% to 16.0%. Using the strictest definitions with high symptom rates and serious functional impairment, PTSD prevalence ranged from 5.6% to 11.3% and depression prevalence from 5.0% to 8.5%. Between 8.5% and 14.0% of all soldiers reported serious functional impairment due to either PTSD or depression symptoms.

This is the first study, to our knowledge, that looked at the prevalence in a population of veterans of OIF across different case definitions of PTSD with the addition of a functional impairment measure. The PTSD functional impairment question was modeled after the PHQ-9 measure for comparability and validity and showed that almost all soldiers who reported PTSD symptoms according to the *DSM-IV* also reported some functional impairment; roughly half reported serious impairment (at the “very difficult” or “extremely difficult” level).

The selection of both the *DSM* and the 50-point cutoffs as anchors for several of the PCL case definitions in this study is supported by a recent review of PCL studies that showed that a high cutoff is necessary to achieve the most accurate prevalence estimate in population research (as distinct from using the test in primary or specialty care settings).¹⁶ In this review, a cutoff of 48 to 50 produced the most accurate estimate of PTSD prevalence in a hypothetical population, with a true prevalence rate of PTSD of 15%. Lower cutoff values produced significant overestimates of prevalence because of the higher number of false positives and lower positive predictive value. Applying the *DSM* definition to the PCL has been shown to correspond to a somewhat lower PCL cutoff of 44 in a military sample.¹⁶ Our study expands on this knowledge by applying the different definitions with the addition of functional impairment.

These prevalence rates based on functional impairment are consistent with earlier estimates in OIF/OEF infantry populations based only on high symptom endorsement.³ For example, Hoge et al reported that 12.9% of Active Component soldiers met PTSD criteria 3 to 4 months postdeployment using a *DSM* definition combined with a PCL score of 50 or higher. In our study, in the Active Component sample at 3 months, 14.8% met the criteria for PTSD using the same criteria that Hoge used, 12.6% met criteria using the *DSM* plus high symptom severity (PCL score ≥ 50) and some functional impairment, and 6.3% met the most stringent definition, *DSM* plus high symptom severity (PCL score, ≥ 50) and serious functional impairment.

This study also showed that comorbid alcohol misuse or aggressive behavior was common across all case definitions. Around 50% of soldiers who screened positive for depression or PTSD, based on the strict definition, also met criteria for alcohol misuse or aggressive behavior (Table 5); aggressive behaviors showed increases in both Active Component and National Guard soldiers from the 3 and 12 months time points. The significant overlap between alcohol misuse, aggressive behavior, and mental disorders highlights the high rate of comorbidity in this population. Responses to the items that assessed aggressive behavior and alcohol misuse had slightly more missing data (7% and 10%, respectively) than other study measures, likely owing to the sensitive nature of endorsing alcohol misuse and aggressive behaviors in this occupational setting. However, we do not believe that the missing data for these items occurred at high enough rates to affect the results given the high valid response rate (more than 90%) and the consistency in the findings across different population subgroups and definitions. These findings indicate that it may be ben-

eficial to screen for alcohol and aggressive behaviors when soldiers present for treatment of PTSD or depression.

Despite efforts to systematically assess soldiers following deployment, dispel stigma, encourage treatment, and improve access to care, the prevalence rates across the study’s case definitions showed increases from the 3- to 12-month time points. These data make clear that, at 12 months following deployment, many combat soldiers have not psychologically recovered, which has immediate implications for current Department of Defense policy and troop rotations supporting OIF and OEF. The time between deployments (dwell time) has been 12 to 18 months for many Active Component combat units. While these data do not directly assess whether increasing dwell time between deployments would be associated with lower mental health disorder rates in returning veterans, the data indicate that, for many, 12 months appears to be insufficient time to recover. Because PTSD may develop or persist months after exposure to trauma, interventions are thought to be best provided as early as possible after returning home.⁶ Providing the time for treatment, intervention, and psychological recovery following deployment is particularly important because many Active Component BCTs have deployed 3 or 4 times to Iraq or Afghanistan, and many National Guard BCTs have also deployed on more than 1 combat tour in the past 8 years, with each extending greater than 12 months with predeployment training.

Increases in the prevalence rates of mental health problems from the 3- to 12-month time points postdeployment were significantly greater among National Guard soldiers. National Guard and Active Component soldiers reported similar rates of combat experiences and similar prevalence rates of mental health problems 3 months postdeployment. Therefore, the emergence of differences by 12 months likely does not have to do with differences in the health effects of combat but rather with other variables related to readjustment to civilian life or access to health care (as noted previously by Department of Defense researchers⁶). Because National Guard soldiers return to civilian status following their deployment, they do not have the same uninterrupted access to military medical care as Active Component soldiers. National Guard soldiers have access to free military medical coverage until 6 months following their deployment, after which they may purchase additional coverage or receive care at veterans affairs medical facilities.²⁶ However, these facilities are often not as conveniently located compared with medical facilities on the same posts as the Active Component units. Other potential differences between National Guard and Active Component soldiers include the time spent continuing to work with unit peers who may provide support for deployment-related problems and the stresses of reintegrating with civilian society and civilian employment. Another difference is that at 12 months postdeployment, Active Component soldiers are becoming collectively focused on the multiple tasks required to prepare a unit for another deployment including heavy training schedules (ie, field exercises). This high level of work engagement may result in less time to address personal problems or lingering mental health issues from a previous deployment.

LIMITATIONS

The data reported here were collected using a cross-sectional design similar to previous studies with large intact military units.^{3,7} Because the survey was anonymous, the data are not longitudinal. However, we are confident that the cross-sectional data were representative of soldiers in combat infantry units who returned from Iraq. Although some soldiers move to other duty locations or leave service shortly after returning home, most remain in the unit with which they deployed. The estimated turnover is 28% during the first year post-deployment (based on the surveys received from those who did not deploy), and it is likely that many soldiers in our study completed both surveys. The study groups also had comparable demographics with the Army combat occupational reference groups, and combat exposure levels were similar to those found in other studies.^{3,24}

There is potential selection bias in terms of soldiers who were available to take part in the survey. The participating units scheduled the recruitment and survey sessions to minimize adverse effects on the work requirements. However, some soldiers may not have been available owing to reasons such as temporary duty elsewhere, being on leave, or attending schools or training. Soldiers who were ill or injured, or who had been removed from the unit for administrative reasons such as drug abuse or misconduct, would also not have been available to take part in the survey. This potential bias is most likely to lead to underreporting of mental health problems in the study population compared with the larger population. Compensation-seeking bias is not likely, given that the surveys were anonymous and not linked in any way with health care or disability agency processes. Although officers typically have lower rates of mental health problems than enlisted soldiers, the undersampling of officers would have had a minimal effect on overall prevalence rates because officers account for less than 15% of all personnel in these combat units.

Additionally, although the sample only included 2 National Guard BCTs (compared with 4 Active Component BCTs), the findings of this study were consistent with another study indicating that soldiers from Reserve Component units appear to have greater increases in mental health problems after returning home than soldiers from active units.⁶ As a whole, our sample of National Guard soldiers was similar to the National Guard reference population on demographic variables other than race/ethnicity. Most importantly, National Guard soldiers were comparable with Active Component soldiers on combat exposure, a leading predictor of postdeployment mental health problems.

IMPLICATIONS AND FUTURE RESEARCH

From an epidemiological perspective, the present study is an important contribution to the literature because it provides a comprehensive assessment of how different case definitions influence PTSD and depression prevalence in combat veterans. Using the same case definition reported by Hoge and colleagues³ across study groups and time points, 23% to 31% of soldiers described symptoms that met DSM

criteria for PTSD or depression along with some functional impairment. Using an even stricter case definition including reporting serious functional impairment across study groups and time points, 9% to 14% still met criteria. Further studies are needed to better understand the nature and severity of the impairment along multiple dimensions to include work, family, and social relationships. Research is also needed to better quantify the effect of comorbid factors such as alcohol misuse, aggression, risk-taking behaviors, and physical symptoms to understand the full extent of the effects of war-related trauma.

We believe that these data have clear implications for the care of soldiers and their families. The findings of the study show that at 12 months following combat, the prevalence of mental health problems among veterans does not abate, and in many cases, increases. It is a virtual certainty that soldiers who remain in service will deploy again; this study shows that a sizable proportion (9%-14%) have depression or PTSD symptoms with serious functional impairment. Data collected from the US Army's Mental Health Advisory Teams has clearly demonstrated that multiple deployments are associated with a higher prevalence of mental health problems,²⁴ and the cumulative effects of combat deployments are worrisome. These data also have implications for individual soldiers and unit peers. If soldiers who are struggling with serious functional impairment as the result of a previous deployment are deployed again, there is potential that this could impair their performance in combat. This has implications for the safety of unit members and mission success. Further research is needed to understand the effects of self-perceived serious impairment and military occupational performance.

Our findings showed that National Guard soldiers' mental health problems increased dramatically from the 3- to 12-month time points. Therefore, it is imperative that members of the National Guard and other Reserve Component units have as ready access to care as Active Component members beyond the first few months of returning home. Functionally and culturally, National Guard soldiers are different from Active Component soldiers in that they return to civilian life after combat and have more restricted health care access.²⁶ It will continue to take a collective effort from Department of Defense, Veterans Affairs, community providers, and veteran organizations to help this generation's veterans readjust after service in Iraq and Afghanistan.

Submitted for Publication: March 24, 2009; final revision received November 3, 2009; accepted November 9, 2009.

Author Affiliations: Division of Psychiatry and Neuroscience, Walter Reed Army Institute of Research, US Army Medical Research and Materiel Command, Silver Spring, Maryland (Drs Thomas, Wilk, Riviere, and Hoge); US Army Medical Research Unit-Europe, Walter Reed Army Institute of Research, US Army Medical Research and Materiel Command, Heidelberg, Germany (Dr McGurk); Military Operational Medicine Research Program, US Army Medical Research and Materiel Command, Fort Detrick, Maryland (Dr Castro).

Correspondence: Jeffrey L. Thomas, PhD, Walter Reed Army Institute of Research, Department of Military Psy-

chiatry, Walter Reed Army Institute of Research, 503 Robert Grant Ave, Silver Spring, MD 20910 (jeffrey.l.thomas@us.army.mil).

Author Contributions: Dr Thomas had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Financial Disclosure: None reported.

Funding/Support: This study was supported by the Military Operational Medicine Research Area Directorate, US Army Medical Research and Materiel Command, Fort Detrick, Maryland.

Disclaimer: The material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the authors, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense.

Additional Contributions: We thank the leaders and the soldiers of the units studied for their service to our nation and their participation in the study. We thank Paul Bliese, PhD, and Richard Herrell, PhD, for their guidance on the manuscript. We thank the Walter Reed Army Institute of Research Land Combat Study Team who collected the data: Wanda Cook, Allison Whitt, Tony Cox, MSW, Oscar Cabrera, PhD, Michael Wood, PhD, Dave Cotting, PhD, Tim Allison-Aipa, PsyD, Julie Clark, MA, Paul Kim, MA, Karen Eaton, MA, Matthew Baker, MA, Athena Kendall-Robbins, MA, Kyle Schaul, Megan Legenos, Nickolas Hamilton, Lloyd Shanklin, Nadia Kendall-Diaz, Duriel Randolph, Michael Brouillard, Lakisha Holley, and Akeiya Briscoe-Cureton.

REFERENCES

1. Smith TC, Ryan MAK, Wingard DL, Slymen DJ, Sallis JF, Kritz-Silverstein D; Millennium Cohort Study Team. New onset and persistent symptoms of posttraumatic stress disorder self-reported after deployment and combat exposures: prospective population-based US military cohort study. *BMJ*. 2008;336(7640):366-371.
2. LeardMann CA, Smith TC, Smith B, Wells TS, Ryan MA; Millennium Cohort Study Team. Baseline self reported functional health and vulnerability to post-traumatic stress disorder after combat deployment: prospective US military cohort study. *BMJ*. 2009;338:b1273.
3. Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *N Engl J Med*. 2004;351(1):13-22.
4. Ramchand R, Karney BR, Chan Osilla K, Burns RM, Barnes Calderone L. Prevalence of PTSD, depression, and TBI among returning service members. In: Tanielian T, Jaycox LH, eds. *Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery*. Santa Monica, CA: RAND Corporation; 2008:35-85.
5. Hoge CW, Auchterlonie JL, Milliken CS. Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *JAMA*. 2006;295(9):1023-1032.
6. Milliken CS, Auchterlonie JL, Hoge CW. Longitudinal assessment of mental health problems among active and reserve component soldiers returning from the Iraq war. *JAMA*. 2007;298(18):2141-2148.
7. Hoge CW, McGurk D, Thomas JL, Cox AL, Engel CC, Castro CA. Mild traumatic brain injury in US soldiers returning from Iraq [published online ahead of print January 30, 2008]. *N Engl J Med*. 2008;358(5):453-463.
8. Weathers FW, Litz BT, Herman DS, Huska JA, Keane TM. The PTSD checklist (PCL): reliability, validity, and diagnostic utility. Annual Meeting of International Society for Traumatic Stress Studies; San Antonio, Texas; October 6-10, 2003.
9. Jacobson IG, Ryan MA, Hooper TI, Smith TC, Amoroso PJ, Boyko EJ, Gackstetter GD, Wells TS, Bell NS. Alcohol use and alcohol-related problems before and after military combat deployment. *JAMA*. 2008;300(6):663-675.
10. Jakupcak M, Conybeare D, Phelps L, Hunt S, Holmes HA, Felker B, Klevens M, McFall ME. Anger, hostility, and aggression among Iraq and Afghanistan war veterans reporting PTSD and subthreshold PTSD. *J Trauma Stress*. 2007;20(6):945-954.
11. Killgore WD, Cotting DI, Thomas JL, Cox AL, McGurk D, Vo AH, Castro CA, Hoge CW. Post-combat invincibility: violent combat experiences are associated with increased risk-taking propensity following deployment. *J Psychiatr Res*. 2008;42(13):1112-1121.
12. Sollinger JM, Fisher G, Metscher KN. The wars in Afghanistan and Iraq: an overview. In: Tanielian T, Jaycox LH, eds. *Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery*. Santa Monica, CA: RAND Corporation; 2008:19-31.
13. Bliese PD, Wright KM, Adler AB, Thomas JL, Hoge CW. Timing of postcombat mental health assessments. *Psychol Serv*. 2007;4(3):141-148.
14. Wilk JE, Thomas JL, McGurk D, Riviere LA, Castro CA, Hoge CW. Mild traumatic brain injury (concussion) during combat: lack of association of blast mechanism with persistent post-concussive symptoms. *J Head Trauma Rehabil*. 2010;25(1):9-14.
15. Santiago PN, Wilk JE, Milliken CS, Castro CA, Engel CC, Hoge CW. Screening for alcohol misuse and alcohol-related behaviors in combat veterans. *Psychiatr Services*. In press.
16. Terhakopian A, Sinai N, Engel CC, Schnurr PP, Hoge CW. Estimating population prevalence of posttraumatic stress disorder: an example using the PTSD checklist. *J Trauma Stress*. 2008;21(3):290-300.
17. Bliese PD, Wright KM, Adler AB, Cabrera O, Castro CA, Hoge CW. Validating the primary care posttraumatic stress disorder screen and the posttraumatic stress disorder checklist with soldiers returning from combat. *J Consult Clin Psychol*. 2008;76(2):272-281.
18. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association; 1994.
19. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study: primary care evaluation of mental disorders: patient health questionnaire. *JAMA*. 1999;282(18):1737-1744.
20. Depression Tool Kit. The MacArthur Initiative on Depression and Primary Care Web site. <http://www.depression-primarycare.org/clinicians/toolkits/>. Accessed August 6, 2008.
21. Spitzer RL, Kroenke K, Williams JBW, Lowe B. A brief measure for assessing generalized anxiety disorder. *Arch Intern Med*. 2006;166(10):1092-1097.
22. Brown RL, Leonard T, Saunders LA, Papasouliotis O. Two-item conjoint screen for alcohol and other drug problems. *J Am Board Fam Pract*. 2001;14(2):95-106.
23. Bliese PD, Wright KM, Adler AB, Hoge CW, Prayner R. Post-deployment psychological screening: interpreting and scoring DD form 2900. US Army Medical Department Resilience Training Web site. <https://www.battlemind.army.mil/deployment.cfm>. Accessed August 14, 2009.
24. Office of the Surgeon Multi-National Force-Iraq and Office of The Surgeon General United States Army Medical Command. Mental Health Advisory Team (MHAT-V) report: Operation Iraqi Freedom 06-08. US Army Department of Medicine Web site. <http://www.behavioralhealth.army.mil/research/index.html>. Published February 14, 2008. Accessed September 3, 2007.
25. Riddle JR, Smith TC, Smith B, Corbeil TE, Engel CC, Wells TS, Hoge CW, Adkins J, Zamorski M, Blazer D; for the Millennium Cohort Study Team. Millennium cohort: the 2001-2003 baseline prevalence of mental disorders in the US military. *J Clin Epidemiol*. 2007;60(2):192-201.
26. TRICARE management activity fact sheet. TRICARE Web site. <http://www.tricare.mil/factsheets/viewfactsheet.cfm?id=317>. Accessed April 12, 2010.