

Invisible Wounds of War

Psychological and Cognitive Injuries,
Their Consequences, and Services to Assist Recovery

TERRI TANELIAN AND LISA H. JAYCOX, EDITORS

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Survey of Individuals Previously Deployed for OEF/OIF

Terry L. Schell and Grant N. Marshall

Introduction

RAND conducted a large population-based survey on individuals previously deployed as part of Operation Enduring Freedom or Operation Iraqi Freedom (OEF/OIF) to address several gaps in the existing literature concerning the prevalence and correlates of mental health conditions and traumatic brain injury (TBI) stemming from service in OEF/OIF. As reported in Chapter Three, research on the prevalence of post-traumatic stress disorder (PTSD) and major depression has typically focused on active duty Army personnel and has largely neglected several types of servicemembers deployed in OEF/OIF. For example, although Air Force and Navy personnel account for 38 percent of the deployed force, few studies have examined the prevalence of PTSD and major depression in these populations. Similarly, only minimal information concerning these conditions exists for marines. Moreover, little information is available regarding the mental health of previously deployed National Guard or Reserve personnel, despite evidence from post-deployment screening that servicemembers of the Army National Guard and Army Reserve are twice as likely as active duty personnel to suffer from mental health problems (Milliken, Auchterlonie, and Hoge, 2007). In addition, almost all research to date has focused on individuals who are within one year of their most recent deployment (e.g., Hoge, Auchterlonie, and Milliken, 2006). These omissions make it difficult to estimate the actual magnitude of combat-related mental disorders in this population.

Although research into the mental health of servicemembers who have served in OEF/OIF has focused on a narrow segment of the whole population, research into the prevalence and correlates of TBI is even less conclusive. With the exception of one recently published study of TBI in infantry soldiers from two brigades (Hoge et al., 2008), most information regarding TBI in previously deployed individuals is based on small samples of treatment-seeking individuals (Murray, Reynolds, Schroeder, et al., 2005) or on internal Department of Defense (DoD) research that has not been peer-reviewed or released publicly; results were available only through the news articles (e.g., TBI: Hidden wounds plague Iraq war veterans, 2007).

Another shortcoming of existing research is that most studies of previously deployed personnel have been conducted under the auspices of DoD, which raises the possibility that respondents may either underreport problems to avoid disclosing career-jeopardizing disorders or overreport to maintain disability or medical benefits. Finally, all publicly released results from DoD studies must be approved through DoD operational security and public-affairs offices. It is generally preferable that the design, analysis, and dissemination of research be controlled by organizations that do not have a direct interest in the outcome.

In this chapter, we describe the methods we employed and results of our large population-based survey of personnel previously deployed for OEF/OIF, designed to assess deployment experiences, current mental health symptoms, use of services, and barriers to care.

Methods

Eligibility and Sampling

To be eligible to participate in the survey, individuals must have been previously deployed as part of OEF/OIF and be reachable at a landline phone number within the United States during the study period. These requirements exclude currently deployed servicemembers, individuals who reside in households without a landline telephone, and those who are hospitalized or incarcerated.

The survey was designed to create a broadly representative sample of the population of individuals who have been deployed as part of OEF/OIF. The sampling strategy targeted 24 geographic areas of the United States that encompass the domestic military bases with the largest overall number of deployed personnel. The geographic sizes of the sampling areas varied according to the geographic distribution of numbers within the selected telephone exchanges and population density. Sizes ranged from approximately 35 square miles to more than 500 square miles. The sampling areas were large enough to encompass both on-base housing and the surrounding communities in which retired and separated servicemembers lived. As described below, screening calls were placed to identify eligible participants. The number of screening calls within each of the geographic areas was approximately proportional to the number of deployed personnel from that area. Table 4.1 lists military installations that are contained within or adjacent to the sampling areas. Because some areas include multiple military installations, the number of installations sampled is greater than 24.

We identified telephone exchanges that are common within the targeted geographic areas and dialed randomly selected numbers from those exchanges. This Random Digit Dialing (RDD) methodology ensures that a random sample of individuals who have telephone numbers in those exchanges were phoned. Randomly selected telephone numbers were dialed up to six times to reach any adult household member

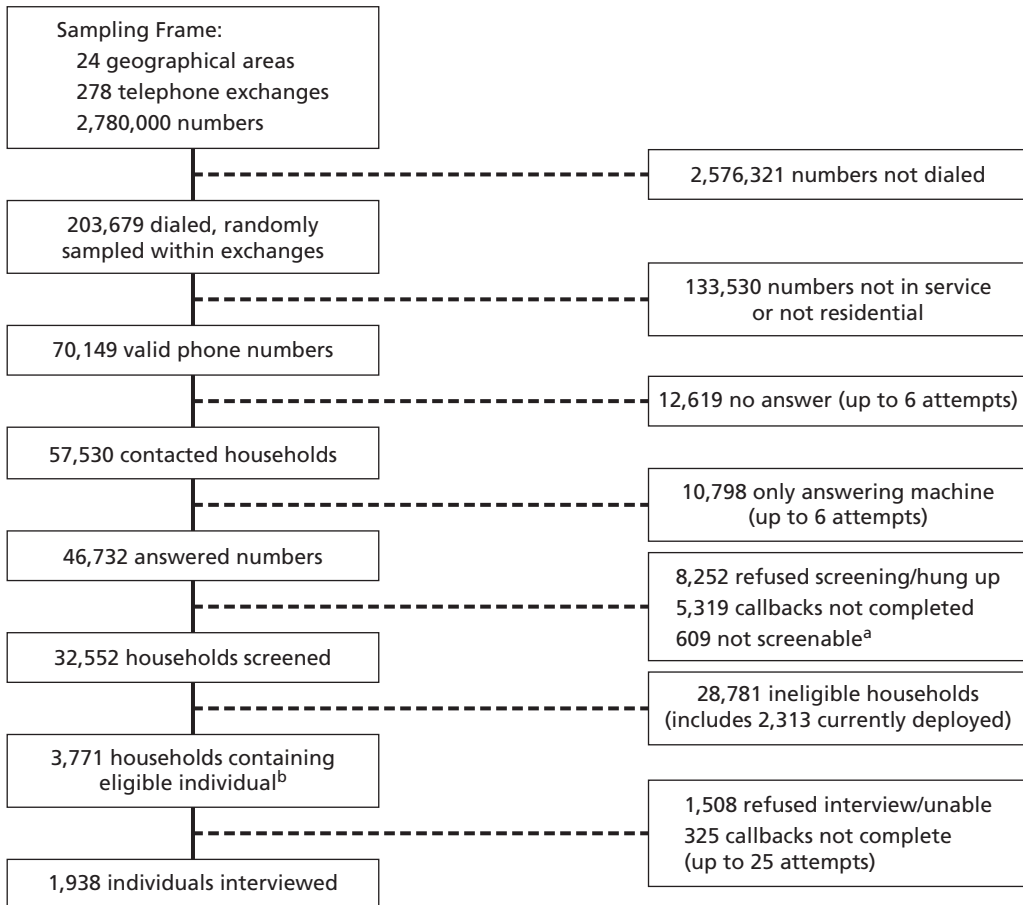
Table 4.1
Major Military Installations in Sampled Areas

Service	Installation
Army	Fort Bragg, NC
	Fort Campbell, TN
	Fort Carson, CO
	Fort Hood, TX
	Fort Lewis, WA
	Fort Riley, KS
	Fort Stewart, GA
Navy	Coronado Naval Amphibious Base, CA
	Coronado North Island NAS, CA
	Little Creek Amphibious Base, VA
	Naval Medical Center Portsmouth, VA
	Naval Station Norfolk, VA
	Oceana NAS, VA
Air Force	Dover Air Force Base (AFB), DE
	Dyess AFB, TX
	Eglin AFB, FL
	Grand Forks AFB, ND
	Hurlburt Field, FL
	Moody AFB, GA
	Pope AFB, NC
	Warner Robbins AFB, GA
Marine Corps	Camp Lejeune, NC
	Camp Pendleton, CA
	Cherry Point Marine Corps Air Station, NC
	Marine Corps Base Hawaii, HI
	Miramar Marine Corps Air Station, CA
	Twentynine Palms Marine Corps Air-Ground Combat Center, CA

to screen for eligibility of all individuals within the household. Households were then screened to determine whether any member of the household had ever been deployed as part of OEF/OIF.

When a household was identified as containing an eligible individual, the telephone number was dialed up to 25 times to obtain either cooperation or a refusal to participate. A sampling flow diagram is included in Figure 4.1 to illustrate the

Figure 4.1
RDD-Sampling Flow Diagram



^aFor example, hearing problem, health problem.

^bPreviously deployed for OEF or OIF.

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disposition of all randomly selected numbers. Following this sampling and recruitment procedure, we completed 1,938 interviews with an overall response rate of 0.44 $([28,781+1,938]/70,149)$; minimum response rate combined for screening interview and main interview). Interviews were conducted between August 2007 and January 2008. In addition to this RDD-based sample, the analytic sample includes 27 respondents who volunteered to participate in the research, through the Military Officers' Association of America and the Iraq and Afghanistan Veterans of America. In total, 1,965 respondents completed an interview.

Informed Consent

This study was approved and monitored by the RAND Institutional Review Board (IRB). We read a consent script to participants that was approved by the RAND IRB. This script read as follows:

The purpose of this study is to learn about the physical, emotional and economic problems faced by people who have returned from a deployment to Iraq or Afghanistan. The research will help to document the medical and psychological needs of servicemembers returning from duty.

Respondents were also told about the risks of participating. The script stated that (1) the respondent could terminate the interview at any time, or skip any question, without penalty, (2) the survey responses themselves were confidential and cannot be revealed even under subpoena because the study has a National Institutes of Health (NIH) certificate of confidentiality, (3) any spontaneous mention of an intent to harm themselves or others would be reported to authorities, and (4) the survey would ask about mental health and traumatic experiences during deployment that may make some respondents uncomfortable. Interview completion was regarded as evidence of consent to participate. As a follow-up, participants were mailed an information sheet describing the study and giving information on how to contact the study investigators, the RAND IRB, and service providers for mental health problems.

Interviews

Trained interviewers used a computer-assisted telephone interview system to query participants. For the most part, we selected measures used in prior research efforts with veterans who had been deployed to Afghanistan and Iraq to maximize the ability to compare findings across studies. The survey, which covered the following topics, lasted 32 minutes on average. A copy of the instrument is available from the authors upon request.

Measures

Sociodemographics. Sociodemographic information, including branch of Service, current duty status, military rank, age, gender, marital status, race/ethnicity, and the nature, number and recency of deployments, was obtained by self-report. To determine duty status, respondents were asked if they were “still in the military” or had “separated from service.” Those who were currently still in the military were also asked if they were currently in the “Guard or Reserve” or if they were “active duty.”

Combat Trauma Exposure. Combat trauma exposure was measured using 11 items that form two indices: (1) a one-item measure that assesses whether the respondent had ever experienced an injury or wound that required hospitalization while deployed and (2) a scale derived by counting the number of ten specific trauma exposures that occurred during any of the respondents’ OEF/OIF deployments. The list of traumatic

combat experiences is adapted from Hoge et al. (2004) and includes both direct and vicarious trauma exposure (e.g., witnessing a traumatic event that occurred to others). The full instrument contained 24 traumatic exposures. However, many items were empirically redundant with one another. The subset of exposures used in the scale was chosen because the remaining items were not predictive of PTSD when controlling for these 11.

Probable PTSD. To assess post-traumatic stress symptoms, we used the Posttraumatic Symptom Checklist–Military Version (PCL-M; Weathers, Huska, and Keane, 1991), an instrument that contains 17 symptom items keyed directly to the *Diagnostic and Statistical Manual*, Fourth edition (DSM-IV; American Psychiatric Association, 1994) and answered with respect to combat-stress experiences on a 5-point scale reflecting extent of symptom severity. The symptoms are then scored according to the DSM-IV definition. Answers were provided for the period “in the last 30 days.” The PCL-M has been used to study post-traumatic distress in various military samples (e.g., Grieger et al., 2006).

Probable diagnoses were derived following guidelines offered by Weathers et al. (1993). In particular, symptoms were counted as present if respondents indicated that they had been “moderately (3)” bothered by the symptom. This scoring has been shown to have high specificity and sensitivity, 0.92 and 0.99, respectively (see Brewin, 2005, for a review of different scoring methods). To examine barriers to care for persons who might have possible need for mental health treatment, we defined *subthreshold PTSD* by counting a symptom as present when it bothered the respondent at least “a little (2).”

Probable Major Depression. The Patient Health Questionnaire–8 was used to assess symptoms of major depression (PHQ-8; Kroenke, Spitzer, and Williams, 2001; Lowe, Kroenke, et al., 2004). The PHQ-8, a variant of the PHQ-9, consists of items assessing the actual criteria on which a DSM-IV diagnosis of major depression is based, with the exception of thoughts of suicide. Responses to the PHQ-8 are provided with respect to the frequency with which symptoms were experienced in the past two weeks, using a 4-point (0–3) scale. The PHQ-8 is well validated and widely used as a brief screening measure (e.g., Lowe, Spitzer, et al., 2004). Probable moderate or severe depression was indicated by a total score of 10 or above, following the recommended cutpoint (Kroenke, Spitzer, and Williams, 2001). This cutpoint yields a sensitivity of 0.99 and a specificity of 0.92, which is slightly more specific than the PHQ-9 (Kroenke, Spitzer, and Williams, 2001). For the purpose of examining barriers to care for persons who might have a possible need for mental health treatment, we also assessed mild depression as indicated by a total score of 5 or more.

Probable TBI. The Brief Traumatic Brain Injury Screen (BTBIS), which has been used by the military to assess personnel returning from OEF/OIF, was used to screen for the presence of probable TBI (Schwab et al., 2007). The BTBIS has demonstrated a positive value for predicting TBI in the OEF/OIF population (Schwab et al., 2007); however, no survey-based assessments of TBI have undergone a rigorous evaluation

of diagnostic efficiency. Probable TBI is indicated by any injury during deployment that resulted in an alteration of consciousness immediately following the injury—e.g., being confused, experiencing memory loss, being unconscious. Meeting screening criteria for having experienced a probable TBI does not require current TBI-related morbidity. Thus, the instrument does not assess ongoing functional or cognitive impairment caused by a TBI. Most individuals who screen positive for having experienced a probable TBI are likely to have full cognitive functioning.

Barriers to Care. To assess barriers to seeking health care for mental health concerns, respondents were asked a single question: “If you wanted help for an emotional or personal problem, which of the following would make it difficult?” This question was followed by statements posed as potential barriers to treatment. Respondents endorsed each statement that they thought would make it difficult to get treatment by responding “yes.” Potential barriers to care were drawn from three separate instruments: The National Comorbidity Survey Replication (NCS-R) (e.g., Kessler et al., 2005); the Hoge et al. (2004) study of barriers to care in the military; and our own instrument, which was developed for use among individuals with a range of traumatic experiences (e.g., Wong et al., 2006). From across these instruments, we selected distinct barriers, maintaining all of the factors found by Hoge et al. (2004) to be highly endorsed in a military sample. For heuristic purposes, we distinguished among three broad classes of barriers to care: logistical barriers (e.g., “it would be difficult to schedule an appointment”), institutional and cultural barriers (“it could harm my career”), and beliefs and preference for treatment (e.g., “even good mental health care is not very effective”).

Past-Year Service Utilization and Adequacy. To determine past-year utilization of services for mental health concerns, we posed several questions. A single question inquired whether respondents had seen any provider for mental health services in the past 12 months—i.e., “In the past 12 months have you visited any professional like a doctor, a psychologist, or a counselor to get help with issues such as stress, emotional, alcohol, drug, or family problem?” Psychotropic drug use was assessed with two questions—i.e., “Have you been prescribed any medication for a mental health or emotional problem in the past 12 months?” and “Did you take the medication for as long as your doctor wanted you to?” For each type of provider seen, additional questions inquired about the number of sessions and the length of the typical session.

Participants were judged to have had a *minimally adequate trial of a psychotropic drug* if they (1) had taken a prescribed medication as long as the doctor wanted, and (2) had at least four visits with a doctor or therapist in the past 12 months. *Minimally adequate exposure to psychotherapy* was defined as having had at least eight visits with a “mental health professional such as a psychiatrist, psychologist or counselor” in the past 12 months, with visits averaging at least 30 minutes. Criteria for minimally adequate courses of treatment were adapted from the NCS-R (Wang et al., 2005). These criteria for minimally adequate treatment of PTSD and major depression were developed by Wang et al. (2005) based on a comprehensive review of available guidelines for

therapies that have demonstrated efficacy. The NCS-R requires that pharmacotherapy be supervised by a physician and be taken for at least eight weeks. We allowed that pharmacotherapy in the military may be supervised by medical personnel other than a physician; also, rather than require a specific treatment length, we asked respondents if they had completed their course of treatment. Whereas the NCS-R also requires that all eight psychotherapy sessions occur with the same provider, our definition did not require a single provider for all sessions.

To obtain information about services received for TBI, we included specific items that inquired whether participants had ever been screened by a doctor or health specialist for a TBI and whether screening was for an injury received during deployment.

Statistical Analysis

Sampling Weights. After we completed data collection, we developed post-stratification weights to improve the representativeness of the analytic sample relative to the target population—all OEF/OIF veterans—and to account for nonresponse in the sampling. The sampling strategy was designed to provide the lowest possible standard errors in our estimates of the overall rates of PTSD, depression, and TBI within the available resources. This strategy resulted in differential sampling probabilities across military groups. For example, we recruited fewer Navy and Air Force personnel than would be expected in a simple random sample (N 's = 1,073, 207, 235, and 450 for Army, Navy, Air Force, and Marines, respectively). The selection of 24 geographic areas with high total numbers of deployments resulted in a designed oversampling of active duty personnel (N 's = 1,530, 360, and 75, for currently active duty, currently separated, and currently Reserve, respectively). In addition to these factors, which are built into the survey design, the study slightly underrepresented males, unmarried individuals, and younger individuals relative to their numbers in the population. These underrepresentations are similar to those found in most RDD studies and are likely related to differences in the use of cell phones and answering machines across these subpopulations. Therefore, our survey design requires weights to create an analytic sample that is broadly representative of the target population. Specifically, the sample was weighted to match the target population (all servicemembers previously deployed to OEF/OIF) on the marginal distribution of branch of Service, and within each branch of Service it is weighted to balance on median age, gender, marital status, officer rank, currently separated duty status, and Reserve Component. The resulting weights allowed us to create an analytic sample that closely matched the total deployed force on critical variables (Table 4.2). The characteristics of the population of previously deployed servicemembers were derived from the Contingency Tracking System Deployment File and the Work Experiences File from the Defense Manpower Data Center (DMDC).

Data Analysis. Using these sample weights, we conducted all analyses in SAS 9.1.3 with *proc genmod* and *proc surveyfreq*. Analyses account for the effects of the weights on both the parameter estimates and their standard errors. Throughout the text and

Table 4.2
Demographic Characteristics of Respondents (N=1,965)

Characteristic	Weighted Percentage	95% CI LL	95% CI UL
Branch			
Army	48.9	45.0	52.7
Navy	18.6	15.3	21.9
Air Force	19.8	16.6	23.1
Marine Corps	12.7	10.2	15.2
Current Duty Status			
Active	38.3	35.1	41.5
Reserve/Guard	14.7	11.1	18.3
Discharged/Retired	47.0	43.0	51.0
Rank			
Enlisted	85.9	83.6	88.2
Warrant Officer	1.8	1.0	2.5
Officer	12.3	10.1	14.6
Race			
White	65.7	61.8	69.5
Black	21.6	18.1	25.2
Hispanic	8.3	6.2	10.3
Other	4.4	2.8	6.0
Current Marital Status			
Not Married	31.8	27.4	36.2
Married	68.2	63.8	72.6
Sex			
Female	11.5	9.1	13.8
Male	88.5	86.2	90.9
Last Deployed			
OEF	21.9	18.4	25.4
OIF	78.1	74.6	81.6
Multiple Deployments			
Yes	46.5	42.6	50.3
No	53.5	49.7	57.4
Time Since Last Deployment (months)			
0–17	34.7	31.2	38.2
18–35	32.5	28.9	36.2
36+	32.8	28.9	36.7
Length of Last Deployment (months)			
<6	25.0	21.5	28.4
6–11	44.9	40.9	48.8
12+	30.2	26.8	33.5
Current Age (years)			
<30	49.9	46.0	53.8
30+	50.1	46.2	54.0

NOTES: CI = confidence interval; LL = lower limit; UL = upper limit.

tables, we report weighted proportions. Proportions and exact binomial 95-percent confidence intervals were calculated for dichotomous outcomes. After describing the rates of exposure to combat trauma, as well as the prevalence of probable PTSD, major depression, and TBI, we examined bivariate and multivariate predictors of the three health conditions. Relative risk ratios for both bivariate and multivariate models, as well as their confidence intervals, were calculated using the method outlined by Zou (2004). Relative risk ratios allow for a more straightforward interpretation than the odds ratios that are typically presented from logistic regressions.

We also estimated the extent to which the observed prevalence of these conditions was attributable to deployment experiences. Specifically, we estimated the prevalence of PTSD, major depression, and TBI for individuals with no reported combat trauma during deployment and compared those numbers to the prevalences in the full sample. We did so using predicted values from a linear model in which each disorder was predicted from the separate traumas. Predicted values and confidence intervals are generated for the case when no traumas occurred.

We then characterized past-12-month mental health service utilization of persons meeting screening criteria for probable PTSD, major depression, or TBI. Finally, we calculated rates of endorsement of barriers to service utilization for respondents who met relaxed criteria for possible need for mental health treatment (i.e., those with sub-threshold PTSD or mild depression).

Results

As shown in Table 4.3, rates of exposure to specific types of combat trauma ranged from 5 to 50 percent, with high reporting levels for many traumatic events. Vicariously experienced traumas (e.g., having a friend who was seriously wounded or killed) were the most frequently reported. Direct injuries were reported by between 10 and 20 percent of the sample.

A substantial percentage of previously deployed personnel are currently affected by probable PTSD and major depression, as displayed in Table 4.4. In particular, rates of PTSD and major depression were both 14 percent. Rates of probable TBI during deployment were also high, exceeding 19 percent. Approximately 19 percent of respondents met criteria for either PTSD or major depression, and 31 percent met criteria for TBI, PTSD, or major depression. Moreover, the three conditions tend to co-occur. Specifically, PTSD and major depression are highly correlated (Spearman's $r=.60$), and these mental health conditions are moderately associated with TBI (Spearman's $r=.29$ and $.26$ for PTSD and major depression, respectively). Approximately two-thirds of those with PTSD also have probable major depression, whereas only one-third of those with TBI also meet criteria for depression.

Table 4.3
Rates of Trauma Exposure in OEF/OIF (N=1,965)

Type of Combat Trauma	Weighted Percentage	95% CI LL	95% CI UL
Having a friend who was seriously wounded or killed	49.6	45.7	53.6
Seeing dead or seriously injured noncombatants	45.2	41.3	49.1
Witnessing an accident resulting in serious injury or death	45.0	41.1	48.9
Smelling decomposing bodies	37.0	33.3	40.7
Being physically moved or knocked over by an explosion	22.9	19.6	26.1
Being injured, not requiring hospitalization	22.8	19.2	26.3
Having a blow to the head from any accident or injury	18.1	15.1	21.1
Being injured, requiring hospitalization	10.7	8.2	13.1
Engaging in hand-to-hand combat	9.5	7.3	11.6
Witnessing brutality toward detainees/prisoners	5.3	3.3	7.3
Being responsible for the death of a civilian	5.2	3.0	7.4

NOTES: CI = confidence interval; LL = lower limit; UL = upper limit.

Table 4.4
Overall Rates of Probable PTSD, Major Depression, and TBI with Co-Morbidity (N=1,965)

Condition	Weighted Percentage	95% CI LL	95% CI UL	Population LL	Population UL
Probable PTSD	13.8	11.1	16.5	181,000	270,000
Probable major depression	13.7	11.0	16.4	181,000	270,000
Probable TBI	19.5	16.4	22.7	269,000	372,000
Co-morbidity					
No condition	69.3	65.7	73.0	1,079,000	1,198,000
PTSD only	3.6	2.0	5.2	32,000	86,000
Depression only	4.0	2.4	5.5	40,000	91,000
TBI only	12.2	9.6	14.8	157,000	243,000
PTSD and depression	3.6	2.3	4.8	38,000	79,000
PTSD and TBI	1.1	0.6	1.7	10,000	27,000
TBI and depression	0.7	0.1	1.4	1,000	22,000
PTSD, depression, and TBI	5.5	3.6	7.4	58,000	121,000

NOTES: Based on 1.64 million individuals deployed to OEF/OIF, assuming that the rate found in the sample is representative of the population. CI = confidence interval; LL = lower limit; UL = upper limit.

These percentages correspond to relatively large numbers of affected individuals. Using 1.64 million as the number of personnel deployed to OEF/OIF (through October 31, 2007) and assuming that the rates found in the current study are representative of the rates in the population, we found that there are 226,000 persons with PTSD, 225,000 individuals with major depression, and 303,000 having either disorder. In addition, our estimate of the prevalence of TBI implies that approximately 320,000 previously deployed persons have experienced a probable TBI.

To help interpret the observed rates of the three outcomes, we compared the prevalence from the full sample to the prevalence for servicemembers who had not experienced any traumatic events during deployment. The estimated rates of PTSD, major depression, and TBI for the unexposed group of deployed servicemembers was 1.5 percent (95-percent CI of 0.6–3.7 percent), 3.3 percent (95-percent CI of 1.5–6.8 percent), and 0.9 percent (95-percent CI of 0.3–2.6), respectively. This pattern suggests that the excess morbidity attributable to deployment-related trauma exposure is approximately 12 percentage points for PTSD, 10 percentage points for depression, and 19 percentage points for TBI.

As shown in Table 4.5, bivariate analyses indicate that several characteristics place individuals at risk for PTSD. Higher rates of PTSD are found for servicemembers of the Army and Marine Corps, and for servicemembers who are not on active duty—i.e., those in the National Guard or Reserve, as well as those who have left the military. Similarly, enlisted personnel, females, and Hispanics are more likely than their counterparts to meet screening criteria for PTSD. Finally, individuals with more-lengthy deployments and more-extensive exposure to combat trauma were at substantially greater risk of suffering from PTSD in the prior 30 days.

A very similar pattern of risk factors was found for major depression in the past two weeks, as shown in Table 4.6. On a bivariate basis, current duty status (i.e., discharged or retired) is associated with increased likelihood of major depression. Similarly, enlisted personnel, Hispanics, and females were more likely than their counterparts to experience current major depression. In contrast, airmen and sailors were less likely than soldiers and marines to meet screening criteria for probable major depression. As with PTSD, individuals with more-lengthy deployments and more-extensive exposure to combat trauma are at greater risk of meeting screening criteria for current major depression. Of particular note, the degree of exposure to combat trauma was the single-best predictor of both PTSD and major depression.

After controlling for differential trauma exposure and other factors in multivariate analyses, some characteristics continued to place individuals at increased risk for current PTSD and major depression. In particular, as shown in Tables 4.5 and 4.6, enlisted personnel, females, and Hispanics were more likely to suffer from both PTSD and major depression. Interestingly, age emerged as a significant multivariate predictor of major depression, with older individuals at greater risk of both conditions, when controlling for other predictors, such as traumatic exposures. Finally, as in the bivariate analyses,

Table 4.5
Correlates of Probable PTSD

Predictor	Bivariate RR	95% CI LL	95% CI UL	Adjusted RR	95% CI LL	95% CI UL
Branch						
Army	1			1		
Navy	0.365**	0.190	0.704	0.718	0.405	1.274
Air Force	0.088***	0.029	0.263	0.180*	0.049	0.668
Marine Corps	0.709	0.427	1.178	0.721	0.383	1.359
Current Duty Status						
Active	1			1		
Reserve/Guard	1.988*	1.033	3.826	1.652	0.885	3.084
Discharged/Retired	1.865***	1.354	2.570	1.487*	1.005	2.201
Rank						
Enlisted	1			1		
Officer/Warrant Officer	0.262**	0.117	0.588	0.396*	0.175	0.899
Gender						
Male	1			1		
Female	1.033	0.583	1.832	1.689*	1.048	2.723
Race						
White	1			1		
Black	1.314	0.778	2.219	1.334	0.795	2.238
Hispanic	3.332***	2.085	5.326	1.881***	1.308	2.705
Other	1.809	0.845	3.872	1.127	0.517	2.460
Current Marital Status						
Married	1			1		
Not Married	1.190	0.738	1.919	0.849	0.568	1.270
Other						
Age (per decade)	0.826	0.648	1.054	1.115	0.868	1.433
Months Since Last Return	1.001	0.991	1.010	1.003	0.991	1.015
Length of Last Deployment (months)	1.116***	1.073	1.161	1.011	0.964	1.061
Number of Traumas (0–10)	1.415***	1.334	1.501	1.341***	1.235	1.457
Seriously Injured	4.210***	2.911	6.087	1.305	0.868	1.964

NOTES: Adjusted relative risk ratios (RRs) control for all other variables included in the table. Relative risk associated with trauma exposure is the incremental risk associated with each additional trauma.

* $p < .05$; ** $p < .01$; *** $p < .001$. CI = confidence interval; LL = lower limit; UL = upper limit.

Table 4.6
Correlates of Probable Major Depression

Predictor	Bivariate RR	95% CI LL	95% CI UL	Adjusted RR	95% CI LL	95% CI UL
Branch						
Army	1			1		
Navy	0.376**	0.190	0.746	0.688	0.401	1.182
Air Force	0.415	0.184	0.935	0.932	0.399	2.176
Marine Corps	0.757	0.454	1.264	0.823	0.512	1.323
Current Duty Status						
Active	1			1		
Reserve/Guard	1.698	0.841	3.431	1.132	0.599	2.140
Discharged/Retired	1.863***	1.350	2.569	1.197	0.830	1.727
Rank						
Enlisted	1			1		
Officer/Warrant Officer	0.140***	0.055	0.357	0.155***	0.059	0.403
Gender						
Male	1			1		
Female	1.680*	1.038	2.718	2.390***	1.448	3.944
Race						
White	1			1		
Black	0.803	0.489	1.319	0.771	0.485	1.227
Hispanic	2.962***	1.827	4.803	1.830***	1.288	2.600
Other	1.878	0.923	3.821	1.583	0.754	3.323
Current Marital Status						
Married	1			1		
Not Married	1.464	0.947	2.264	1.204	0.795	1.825
Other						
Age (per decade)	0.915	0.745	1.125	1.355	1.108	1.657
Months Since Last Return	1.003	0.992	1.013	1.004	0.990	1.018
Length of Last Deployment (months)	1.084	1.037	1.134	1.019	0.968	1.072
Number of Traumas (0–10)	1.362	1.284	1.445	1.329	1.220	1.448
Seriously injured	4.093	2.826	5.930	1.404	0.912	2.160

NOTES: Adjusted risk ratios (RRs) control for all other variables included in the table. Relative risk associated with trauma exposure is the incremental risk associated with each additional trauma.

* $p < .05$; ** $p < .01$; *** $p < .001$. CI = confidence interval; LL = lower limit; UL = upper limit.

extent of exposure to trauma remained the most important multivariate predictor of both PTSD and major depression. For example, an individual who experienced five of the listed traumas is at more than 4 times the risk for both PTSD and depression relative to someone who experienced none of these traumas but who is otherwise similar in age, gender, rank, ethnicity, branch or Service, deployment length, etc.

As shown in Table 4.7, bivariate analyses indicate that several characteristics place individuals at risk for experiencing a probable TBI during deployment. Individuals who serve in the Army and the Marine Corps are more likely than others to have had a TBI. Similarly, males, enlisted personnel, and younger individuals are more likely to report experiencing a TBI during deployment. Finally, persons who experienced greater total deployment and more-extensive exposure to combat trauma were at greater risk of a probable TBI during deployment. After adjusting for covariates, however, we found that only the combat trauma exposures remained significant predictors of probable deployment-related TBI. In other words, differences between demographic groups were almost entirely attributable to differences in combat exposure among these groups.

Utilization of mental health services among persons with probable PTSD or major depression was similar to rates found in the general population of the United States (Wang et al., 2005). In particular, just over one-half of participants who met screening criteria reported having seen a physician or a mental health provider about a mental health problem in the previous 12 months (see Table 4.8). About one-third of those in need of assistance reported having been prescribed medication for a mental health problem. At the same time, the majority of individuals with a need for services had not received minimally adequate care. Specifically, only 30 percent had received any type of minimally adequate treatment; 18 percent had received minimally adequate psychotherapy and 22 percent had received a minimally adequate course of pharmacotherapy.

With respect to screening for TBI among persons who reported a probable TBI during deployment, the majority (57 percent) had never been evaluated by a physician or specialist for possible brain injury.

Self-assessed barriers to seeking care for mental health problems were examined among those who currently met screening criteria for either mild depression or subthreshold PTSD. Examination of the three broad classes of barriers revealed that institutional/cultural barriers were the most frequently endorsed class of obstacles (see Table 4.9). In particular, respondents were most likely to regard concerns about confidentiality and discrimination as presenting barriers to seeking treatment. For example, the belief that seeking care could harm one's career was endorsed by over 40 percent of persons. Concern about the possible inability to receive a security clearance in the future and the belief that medical records would not be kept confidential were also widely endorsed. Some beliefs about mental health treatment may also constitute significant barriers to service-seeking. Specific impediments include concerns about the

Table 4.7
Correlates of Probable TBI

Predictor	Bivariate RR	95% CI LL	95% CI UL	Adjusted RR	95% CI LL	95% CI UL
Branch						
Army	1			1		
Navy	0.465*	0.242	0.894	1.003	0.534	1.886
Air Force	0.209***	0.099	0.440	0.651	0.275	1.543
Marine Corps	1.188	0.815	1.732	1.053	0.705	1.572
Current Duty Status						
Active	1			1		
Reserve/Guard	0.921	0.496	1.710	0.884	0.519	1.507
Discharged/Retired	1.124	0.839	1.504	1.089	0.714	1.662
Rank						
Enlisted	1			1		
Officer/Warrant Officer	0.514*	0.300	0.882	0.843	0.501	1.418
Gender						
Male	1			1		
Female	0.414*	0.205	0.833	0.793	0.369	1.701
Race						
White	1			1		
Black	0.553*	0.356	0.859	0.714	0.464	1.100
Hispanic	1.288	0.762	2.177	0.904	0.625	1.307
Other	1.299	0.678	2.490	0.946	0.533	1.677
Current Marital Status						
Married	1			1		
Not Married	1.168	0.789	1.728	0.979	0.666	1.439
Other						
Age (per decade)	0.730**	0.600	0.889	1.020	0.839	1.239
Months Since Last Return	0.995	0.986	1.004	0.999	0.985	1.013
Length of Last Deployment (months)	1.077***	1.030	1.126	1.002	0.952	1.055
Number of Traumas (0–10)	1.525***	1.449	1.605	1.434***	1.340	1.535
Seriously Injured	5.058***	3.886	6.583	1.409*	0.989	2.009

NOTES: Adjusted relative risk ratios (RRs) control for all other variables included in the table. Relative risk associated with trauma exposure is the incremental risk associated with each additional trauma.

* $p < .05$; ** $p < .01$; *** $p < .001$. CI = confidence interval; LL = lower limit; UL = upper limit.

Table 4.8
Utilization of Mental Health Services in the Past 12 Months Among Those with a Need for Services (N=326)

	Weighted Percentage	95% CI LL	95% CI UL
Any mental health visit to doctor or mental health specialist	52.7	43.4	61.9
Any prescription for mental health	36.5	27.7	45.3
Any minimally adequate treatment	30.1	21.4	38.7
Minimally adequate talk treatment	18.4	11.6	25.2
Minimally adequate drug treatment	22.3	14.2	30.4

NOTES: *Need* defined by having probable major depression or probable PTSD. CI = confidence interval; LL = lower limit; UL = upper limit.

side effects of medication, a preference for relying on friends and family rather than on mental health professionals, and reservations about the effectiveness or quality of available treatments. Logistical barriers (e.g., high cost of services) were generally endorsed at lower rates than is typical of the general population (Sareen et al., 2007). Yet, logistical barriers may still be important obstacles to care, particularly for individuals who are not on active duty.

Discussion

This study had two broad objectives concerning the mental health of military personnel deployed for OEF/OIF. The first objective was to determine the prevalence and correlates of PTSD, major depression, and deployment-related traumatic brain injury. The second was to assess mental health service utilization and self-assessed barriers to care for individuals with potential treatment needs.

With respect to the first objective, these results reveal that significant numbers of previously deployed personnel currently suffer from PTSD and major depression. In particular, 14 percent met screening criteria for probable PTSD and 14 percent met screening criteria for probable major depression. Moreover, the two conditions were frequently found to co-occur, with approximately two-thirds of those with PTSD also meeting criteria for major depression. The vast majority of both PTSD and major depression cases can be attributed to the traumatic experiences that occurred during OEF/OIF deployment. Assuming that the prevalence found in this study is representative of the population, these results suggest that as many as 300,000 previously deployed individuals suffer from one of these two disorders. Given the significant disability and functional impairment associated with PTSD and major depression (Kessler, 2000; Ustun and Kessler, 2002; see also Chapter Seven of this monograph), this

Table 4.9
Barriers to Care Among Those with a Possible Need for Services (N=752)

Type of Barrier	Weighted Percentage	95% CI LL	95% CI UL
Logistical			
It would be difficult to get childcare or time off of work	29.3	23.0	35.6
Mental health care would cost too much money	23.1	16.7	29.5
It would be difficult to schedule an appointment	15.9	11.8	20.1
I would not know where to get help or whom to see	15.9	10.6	21.2
It would be difficult to arrange transportation to treatment	6.6	2.6	10.5
Institutional and cultural			
It could harm my career	43.6	37.0	50.0
I could be denied a security clearance in the future	43.6	37.0	50.2
My coworkers would have less confidence in me if they found out	38.4	32.2	44.7
I do not think my treatment would be kept confidential	29.0	23.1	34.9
My commander or supervisor might respect me less	23.0	17.4	28.5
My friends and family would respect me less	11.5	7.6	15.5
I could lose contact or custody of my children	9.3	5.7	12.9
My commander or supervisor has asked us not to get treatment	7.8	3.4	12.2
My spouse or partner would not want me to get treatment	2.9	1.0	4.9
Beliefs and preferences for treatment			
The medications that might help have too many side effects	45.1	38.1	52.2
My family or friends would be more helpful than a mental health professional	39.4	32.7	46.1
I would think less of myself if I could not handle it on my own	29.1	23.3	35.0
Religious counseling would be more helpful than mental health treatment	28.8	22.9	34.7
Even good mental health care is not very effective	25.2	18.7	31.7
The mental health treatments available to me are not very good	24.6	18.3	30.8
I have received treatment before and it did not work	18.0	13.5	22.6

NOTES: *Possible need* is defined as having at least mild depression or subthreshold PTSD. CI = confidence interval; LL = lower limit; UL = upper limit.

estimate highlights the critical importance of providing appropriate mental health care to this population.

The rates of PTSD and major depression found in the current study are generally comparable to figures reported in other investigations of persons deployed for OEF/OIF, despite significant differences in the methods used and the samples studied (Hoge, Auchterlonie, and Milliken, 2006; Hoge et al., 2004; Erbes et al., 2007; Seal et al., 2007; Kolkow et al., 2007). Most of these studies focused on active duty, enlisted combat forces in the Army or Marine Corps. Thus, they typically underrepresented individuals at the highest risk (e.g., reservists and persons separated from service), as well as those at lowest risk (e.g., Air Force and officers). The major exception to this pattern involves a recent investigation of participants in a longitudinal study of military personnel (Smith et al., 2008). Although the overall prevalence of PTSD among previously deployed servicemembers was not included in the latter report, it can be calculated to be 6 percent based on data presented in their tables. The discrepancy in rates between Smith et al. (2008) and most other studies is likely due to a substantial overrepresentation in the Smith et al. study of those individuals at lowest risk for PTSD (e.g., officers and airmen). It may also be due to a focus on deployments that occurred primarily in 2002–2004, before the escalation of the Iraq insurgency.

For several methodological reasons, our estimates of the mental health problems suffered by deployed personnel are likely to constitute an undercount of servicemembers who will experience problems following deployment for OEF/OIF. First, many of the respondents who did not meet screening criteria for PTSD and major depression in the past 30 days will have met criteria at some time in the past or will meet it at some point in the future. This study is, essentially, a snapshot of mental health problems at one point in time, whereas the symptoms of those with PTSD or major depression tend to fluctuate over time. In addition, servicemembers who are currently deployed, and thus ineligible for study participation, are likely to have more total time deployed and greater trauma exposure than individuals who are in the United States. Stated differently, the servicemembers who have spent the most time in Iraq were more likely to be there during the study period. Finally, the total number of individuals who have been deployed continues to increase as combat continues, and trauma exposure is ongoing among those deployed.

This study also provides the best data available to date regarding the extent to which deployment is associated with probable TBI. Whereas Hoge et al. (2008) reported rates approaching 15 percent in a study of two brigades of infantry soldiers who had experienced significant combat, our research indicates that the overall deployed force is likely to have had similar exposure to TBI: 19 percent met screening criteria for having experienced a probable TBI. This rate is also similar to those reported in unpublished studies of persons previously deployed for OEF/OIF (e.g., TBI: Hidden wounds plague Iraq war veterans, 2007). Assuming the rate observed in this sample is representative of the full population, we suggest that there are approximately 300,000 injured persons.

From the available data in this population, it is not possible to estimate the overall level of impairment caused by these brain injuries. Traumatic brain injury varies in magnitude from mild to severe, and the extent of cognitive and functional impairment varies dramatically. In the civilian sector, at least 75 percent of head injuries is estimated to be mild in severity (National Center for Injury Prevention and Control, 2003), although we do not know if this distribution is similar to those injured in Afghanistan and Iraq. Historically used interchangeably with the term *concussion* (Bigler, 2008), mild brain injury is associated with full functional recovery in 85 to 95 percent of cases (e.g., Ruff, 2005; McCrea, 2007). In a systematic review of the civilian literature, Carroll et al. (2004) concluded that most persons with mild TBI recover within three to 12 months. Nonetheless, mild as well as moderate and severe brain injuries can all result in significant long-term impairment, including difficulty in returning to work.

These results should not be seen as direct evidence of a substantial TBI-related disability problem among those returning from deployment. Little is known about the long-term effects of this very common injury. Sequelae may be quite diverse and difficult to link to the injury. Moreover, most of those who reported experiencing this injury have not been evaluated or reassured that they are likely to have experienced a mild injury. Given this situation, the potential exists for ordinary post-deployment adjustment problems to be misattributed to TBI. For this reason, all persons with suspected TBI should be evaluated to document a disability, or the lack of a disability, and to ensure that necessary rehabilitation services are provided. Although military and Veterans Health Administration leaders have recently announced programs to expand TBI screening, future research will need to investigate the extent of progress on this issue. In addition, a great deal of research is needed to document the natural course of symptoms, to determine the association of TBI with other mental health symptoms, and to validate methods for identifying which injuries are likely to result in functional impairment.

The current research also determined that certain characteristics place individuals at risk for probable PTSD, major depression, and TBI. The same general pattern of findings was observed for both PTSD and major depression. In particular, after adjusting for a range of factors, we found that PTSD and major depression were more likely to be experienced by enlisted personnel, Hispanics, females, older persons, and those who had been injured or exposed to more extensive combat trauma.

These results are broadly consistent with findings that have emerged from studies of civilian populations. For example, relative to males, females are known to be at greater risk for depression (e.g., Kessler et al., 2005). Similarly, a growing body of data suggests that Hispanic Americans appear more likely than their non-Hispanic counterparts both to develop post-traumatic stress disorder and to experience more-extreme symptoms of PTSD in response to both combat-related and non-combat-related trauma exposure (Adams and Boscarino, 2006; Galea et al., 2002; Kulka et al., 1990; Pole et

al., 2001). Moreover, our findings that servicemembers from the Reserve Component are at heightened risk for PTSD and major depression are in close agreement with other research indicating that Reserve personnel are approximately twice as likely as active duty personnel to meet screening criteria for needing mental health services following deployment for OEF/OIF (Milliken, Auchterlonie, and Hoge, 2007).

Many of these risk factors' effects were quite powerful. For example, very few cases of PTSD were found among Air Force personnel or officers, and almost no cases among those without combat trauma. These findings of subgroups with extremely low rates of PTSD are also helpful for evaluating the specificity of our PCL scoring. Such low rates are inconsistent with a scoring criterion that yields insufficient diagnostic specificity.

These findings support several broad conclusions relevant to the mental health of OEF/OIF veterans. First, this study highlights several risk factors for PTSD and major depression other than exposure to combat trauma. This knowledge could be used to target servicemembers of high-risk groups for possible preventive interventions, as well as to assist in outreach, identification, and treatment of persons in need of mental health treatment. These results also identify groups of individuals who are highly resilient (i.e., have low rates of mental health problems), even when controlling for exposure to trauma.

In particular, officers rarely develop mental health problems, even when exposed to trauma. However, it is possible that the low risk observed among officers and Air Force personnel is due to qualitatively different exposures to trauma. That is, these individuals' traumatic experiences may have been different from their counterparts' because of differences in scope of work or mission. Thus, officers and Air Force personnel may have experienced less severe forms of trauma, even when they had similar trauma scores. Further study of the origins, nature, and malleability of these risk factors is warranted. Such study might focus, in particular, on determining whether factors that confer resilience in officers might be amenable to modification in others at greater risk for mental health problems. In addition, although research has focused on PTSD as the most salient psychiatric sequelae of combat exposure, the results of this study, as well as those of other recent research (e.g., Grieger et al., 2006) reveal that major depression is also strongly associated with war trauma. This evidence suggests the need for additional research. Such research might examine, for example, whether treatments that are effective for major depression in the general population (e.g., pharmacotherapy) are also effective with major depression that occurs following combat trauma.

Finally, while controlling for combat trauma and demographic factors, we found no significant evidence that the length of time since deployment was associated with either PTSD or major depression. The latter finding may be important inasmuch as previous research has suggested that mental health problems associated with service for OEF/OIF may increase with the passage of time (Milliken, Auchterlonie, and Hoge, 2007). This difference across studies may be due to the different periods being studied.

The current sample includes a 0–5-year range of time since last deployment, whereas other studies (e.g., Milliken, Auchterlonie, and Hoge, 2007) have focused on a much narrower window. Longitudinal research is needed to rule out other explanations for these findings and to convincingly describe symptom trajectories.

These results also document a large—and largely unmet—need for psychological services in this population. More than half of those who had a need for treatment reported having visited a health professional for help with these problems in the previous 12 months. This rate of care-seeking is comparable with that reported for persons with PTSD or major depression in the general population (Wang et al., 2005). However, seeking help is not the same as getting treated, and a substantial majority of OEF/OIF veterans with a need for mental health services do not appear to be receiving adequate mental health care. Specifically, almost half of those who brought their problems to the attention of a health professional in the preceding 12 months did not receive minimally adequate treatment (i.e., they did not get at least eight sessions of psychotherapy or a minimal course of medication). Inasmuch as this study did not examine whether empirically supported therapies had been delivered, it is likely that the proportion of individuals who received care that has been demonstrated to be effective is necessarily even smaller. These findings suggest that there is considerable room for improvement in (1) referral into treatment, (2) retention in treatment, and (3) the adequacy of treatment provided for servicemembers in need of mental health treatment following deployment for OEF/OIF.

This study also suggests that nearly 60 percent of persons who experienced a probable brain injury during deployment for OEF/OIF have not been evaluated for this condition by a physician or other health specialist. Most brain injuries are mild in severity, and the injured individual is likely to recover fully within three to 12 months. Nonetheless, 5 to 15 percent of persons with mild brain injury suffer from protracted problems. Given the frequency with which OEF/OIF veterans meet screening criteria for probable brain injury, a substantial number of individuals are likely to suffer from the unrecognized and untreated consequences of TBI. At present, little empirical evidence exists to document the effectiveness of interventions for mild brain injury (Elgmark Andersson et al., 2007; Ghaffar et al., 2006; Paniak et al., 2000). The challenge of developing and conducting rigorous evaluation of treatments for mild brain injury presents an important opportunity to help OEF/OIF veterans.

Additionally, this research supports several conclusions regarding barriers to receiving care for mental health problems. Some of the most frequently reported obstacles are institutional or cultural. Respondents were particularly likely to report concerns that getting treatment would negatively affect their current or future occupational opportunities. In a similar vein, concerns about confidentiality were also paramount. Getting mental health treatment is perceived as restricting or foreclosing opportunities for promotions and future employment. Addressing these barriers will likely require some method for personnel to receive confidential services. Merely changing attitudes about

mental health and cognitive conditions is, in itself, unlikely to lower these barriers to treatment, so long as treatment records could be used against an individual servicemember in his or her assignments and promotions.

Given that efficacious treatments exist for both PTSD and major depression (e.g., Butler et al., 2006; Hollon et al., 2005; Institute of Medicine, 2007; Pampallona et al., 2004), most individuals who suffer from these conditions are likely to be able to return to normal levels of functioning with the provision of appropriate health care. Identification and implementation of strategies to facilitate confidential access to care for individuals in need is likely to raise overall levels of readiness of military personnel. To be clear, we are not suggesting that it is desirable to have absolute confidentiality in military mental health treatment; as in the civilian sector, treatment providers should have a legal obligation to report to authorities and commanders any patients who represent a threat to themselves or others. We are suggesting, however, that information about a servicemember's mental health services not be revealed to others unless he or she has been found to have a functional impairment that substantially affects assigned duties. The issue of facilitating utilization of available treatments will be discussed in more detail in Chapter Seven.

Other concerns of a substantial number of persons in need of mental health treatment include the potential side effects associated with medication use, as well as the belief that the mental health treatments available to them are unlikely to be helpful or are not of the highest quality. These concerns might best be addressed with multiple strategies, including education about mental health treatment and increasing the availability of a broader range of evidence-based psychotherapies. Given that many individuals wish to avoid the side effects of existing pharmacotherapies, and that psychotherapies are considered by many to be the best available treatment for PTSD (Institute of Medicine, 2007), the mental health care system servicing this population should seek both to expand the use of evidence-based psychotherapy for the treatment of PTSD and to address institutional factors that might hamper its use. In addition, it may be productive to further research the beliefs about the side effects of drugs used to treat PTSD and major depression. To the extent that these concerns are based on a misunderstanding of the actual side effects of these medications, education may diminish the prominence of this barrier to treatment.

Finally, this study found that a large number of individuals who might benefit from mental health services would prefer to seek help from friends, family, and clergy. To the degree that individuals with mental health problems are consulting with these nonprofessionals instead of seeking services from professional health care providers, programs designed to educate these lay-providers might help to facilitate ultimate referral to health care providers. In addition it may be possible to train such lay-providers to provide other helpful services and support to affected individuals that may improve recovery.

Strengths and Limitations

In considering these conclusions, it is important to recognize both the strengths and limitations of this study. RDD with post-stratification weights is the gold-standard method for sampling in telephone-based research, and it is used by almost every major public-opinion and public-health telephone survey that attempts to assess a broad population. This approach is used as the primary means of data collection for the best studies of mental health within the U.S. population, such as the National Comorbidity Survey Replication (e.g., Kessler et al., 2005).

The methodology used in this study has several significant advantages over other sampling methods that have been used to study mental health conditions and TBI in OEF/OIF veterans. The principal advantage, for our purpose, is that it enabled inclusion of a very wide range of individuals and experiences relative to samples that are collected within a single unit, base, or branch of Service. The approach allowed us to include personnel from each branch of Service and a broad spectrum of occupational specialties, as well as a range of deployment characteristics (e.g., length of deployments or elapsed time since previous deployment). A second advantage of this approach is that respondents were offered a level of confidentiality that is not always offered in the published studies conducted directly by the military or the VA. The participants' responses cannot be included in their personnel or medical records, the interviewer is not another servicemember or co-worker, and the data are protected from subpoena by virtue of an NIH certificate of confidentiality. This greater confidentiality may improve data quality by partially addressing servicemembers' concerns about disclosing mental health problems. In addition, this approach provides some measure of protection against over-reporting biases associated with efforts to gain or maintain disability benefits (Smith et al., 1999). Although, these response biases are likely small, the research is a useful adjunct to the research conducted by DoD and the VA because it helps to corroborate findings using different methodologies.

In addition to these strengths, the methods used have several limitations. Several coverage limitations are inherent in telephone sampling. In particular, eligible individuals in the population can participate only if they have a land-based telephone number—i.e., calls cannot be placed to cell phones. Moreover, we do not have a good estimate of the number of eligible individuals excluded by the lack of a land-based telephone line. However, the omission of these individuals is a threat to the validity of the study only to the extent that having a landline is associated with outcomes of interest. Similarly, telephone-based samples often slightly underrepresent males and unmarried individuals relative to the population. The effects of these underrepresentations on population estimates have, however, been mitigated through application of post-stratification weights. We know the number of males and unmarried individuals in the eligible population and can create an analytic sample that reflects this composition.

RDD sampling is also limited in its ability to locate eligible individuals when the total pool of qualified participants is relatively rare. Whereas most active duty person-

nel live within geographic proximity to the military bases at which they are stationed, servicemembers of the National Guard and Reserve, as well as retired and discharged personnel, are more widely dispersed. Thus, these components are underrepresented in the sample. Although we were able to compensate partially for this underrepresentation using sampling weights, it is possible that National Guard/Reserve personnel living in proximity to domestic military installations are different in unmeasured ways from those who live elsewhere. Similarly, this study is missing individuals who were hospitalized, incarcerated, or currently deployed. To the extent that these groups of individuals constitute both a significant portion of the deployed personnel and have different rates of the three conditions, the overall results may be inaccurate.

In addition, this research relied on self-report as the sole method of data collection. The diagnostic measures used in this study have well-demonstrated sensitivity and specificity, and they are the standard measures used in epidemiological studies of the U.S. military. However, to the extent that additional sources of information might have yielded different findings, these results should be viewed with caution and additional research is warranted. Future research might, for example, document the presence of mental health problems using structured diagnostic interviews or other sources of data to assess the health care provided to OEF/OIF veterans. Specifically, our criteria for determining minimally adequate care are based solely on the number and duration of treatment, not on whether an individual was documented to have received an effective intervention. It would be helpful to determine whether the care received corresponds to documented evidence-based therapies. Moreover, many of the important predictors used in the current study (e.g., trauma exposure, rank), as well as the eligibility criteria (deployment for OEF/OIF), could be influenced by self-report biases and were not independently verified. For instance, it is possible that some Reserve Component servicemembers who were activated at the time of the study reported themselves as being on active duty, rather than in the Reserves. To the extent that the current results depend on the manner in which these constructs are assessed, additional research is required.

Finally, although the current study includes a relatively large number of respondents, samples of many subpopulations that may be of interest are relatively small (e.g., women, reservists, warrant officers, unmarried). Consequently, this study may not be able to detect as statistically significant some risk factors that are clinically meaningful. Because of the limited statistical power for estimates in these subpopulations, the reader is cautioned against inferring that a nonsignificant predictor in the current study indicates that this variable is not a clinically important risk factor.

Conclusions

A telephone study of 1,965 previously deployed individuals sampled from 24 geographic areas found substantial rates of mental health problems in the past 30 days, with 14 percent screening positive for PTSD and 14 percent, for major depression. Assuming that the prevalence found in this study is representative of the 1.64 million servicemembers who have been deployed for OEF/OIF, these findings suggest that approximately 300,000 servicemembers and veterans have combat-related mental health problems. A similar number, 19 percent, reported a probable TBI during deployment. More than two-thirds of the individuals with combat-related mental health problems did not receive minimally adequate mental health treatment in the prior year. Similarly, most individuals who experienced a TBI have not been evaluated by a doctor to determine the extent of the injuries.

Respondents endorsed many barriers that inhibit getting treatment for mental health problems. In general, respondents were concerned that getting such treatment would not be kept confidential and would be used against them in future job assignments and career advancement. Respondents were also concerned that drug therapies for mental health problems may have unpleasant side effects. These barriers suggest the need for increased access to confidential, evidence-based psychotherapy to maintain high levels of readiness and functioning among previously deployed servicemembers and veterans.

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