

Invisible Wounds of War

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

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Prevalence of PTSD, Depression, and TBI Among Returning Servicemembers

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As Kessler (2000) has noted: “Any assessment of the societal impact of a disorder must begin with a consideration of prevalence” (p. 4). By critically reviewing the current epidemiological studies on post-traumatic stress disorder (PTSD), depression, and traumatic brain injury (TBI) following deployment to Afghanistan and Iraq, we aim specifically to address several questions of both scientific and political importance, including: How widespread are mental health and cognitive conditions in the military currently? How do rates of mental health and cognitive conditions differ among troops deployed to Afghanistan, those deployed to Iraq, and nondeployed troops? How long do conditions and associated symptoms last? How are conditions distributed across the services of the military? Are there differences by gender, ethnicity, rank, or service?

This chapter reviews and describes the best available data on the prevalence of mental health and cognitive conditions endured by servicemembers in the current conflicts. Unlike previous conflicts, such as the Vietnam War or Gulf War, on which prevalence studies were generally conducted years after servicemembers returned home, in the current conflicts epidemiologic studies are being conducted throughout the course of the deployment cycle—i.e., a week before being deployed, while troops are in theater, and immediately upon their return. Comparisons of prevalence rates obtained across these assessments may provide unique insights into mental health and cognitive conditions in the military in general and how the experience of these conditions may be related to deployment. In sum, this chapter describes the current landscape of mental health and cognitive conditions among servicemembers of the military deployed to Afghanistan and Iraq, in hopes of highlighting where future problems, vulnerabilities, and resource needs may lie.

Methods

Epidemiologic studies addressing the prevalence of PTSD, major depression, and TBI among servicemembers deploying or deployed to Afghanistan and Iraq were identi-

fied by searching peer-reviewed journals for relevant articles, using systematic search approaches on PubMed and PsycINFO databases. Search terms included Military, War, Veterans, Combat, Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), Afghanistan, Iraq, Prevalence, PTSD (Stress disorders, Post-Traumatic), Depression/Depressive disorder, Traumatic Brain Injury, Mental disorders, and Mental health. Keywords were used to search titles, abstracts, and the text of articles, and there were no publication-year restrictions. When more than one article presented prevalence information on the same sample, we chose the earliest-published article. Reference lists of pertinent articles identified in database searches were examined in a cited reference search that identified government reports as well as other peer-reviewed articles. Studies were considered eligible for inclusion only if the study population included U.S. military populations deployed to Afghanistan and Iraq (although we included two studies of servicemembers from corresponding United Kingdom [UK] and Dutch deployments), and if the reported study outcomes included prevalence figures for PTSD, depression, or TBI before deployment, in theater, or post-deployment.

Results

In total, we identified 22 independent studies that have provided specific evidence of the prevalence of PTSD, major depression, and/or brain injury among troops deployed or deploying to Afghanistan and/or Iraq. Tables 3.2 through 3.23 summarize the characteristics and results of each of these studies. Before reviewing the results from these studies, we first discuss the methods that these studies used to identify cases of PTSD, major depression, and/or TBI. Knowing the methods used to identify cases is important for understanding how to interpret study results. We then provide an overview of the prevalence estimates from studies that have assessed servicemembers before deployment, in theater, and upon returning from deployment. We proceed to then identify and elaborate upon themes that emerged from an analysis of the group of studies as a whole.

Screening for PTSD, Depression, and TBI in Epidemiological Surveys

In psychiatric epidemiology, three methods are commonly used to identify “caseness” (i.e., who has a disease or disorder, referred to as *cases*, and who does not): diagnostic codes from case registries among individuals in *treatment contact* (i.e., receiving some type of medical care); screening tools that identify persons with probable disorders; and diagnostic interviews that assign actual diagnoses based on criteria set forth in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) [American Psychiatric Association, 2000] or *International Classification of Diseases* (ICD). Diagnostic interviews may be either fully structured (administered by trained lay interviewers) or semi-structured (administered by clinicians) (Jablensky, 2002). Each method varies in

its *validity*, or its ability to distinguish who has a particular disorder and who does not. The validity of a screening tool can be measured by its *sensitivity*, or the proportion of persons with a given condition correctly identified by the screening tool as having the condition, and its *specificity*, or the proportion of persons without a condition correctly identified by the screening tool as not having the condition.

For most screening tools, there is typically a trade-off between sensitivity and specificity, and choosing one tool over another should be based on the ultimate goal of the research. A highly sensitive tool with lower specificity will detect most true cases, but some of those individuals without the disorder will be incorrectly identified as “positive.” A highly specific tool with low sensitivity might detect fewer actual cases, but the cases detected are almost certain to be true cases. Thus, researchers need to decide whether the goal of their research is to identify all possible cases or only to identify true cases, or something in between the two.

Defining a Case

Since the methods of detection vary across studies, it is important to understand the way each defines a *case* in order to be able to interpret the results appropriately. Thus, we explain the different screening methods before presenting results.

Diagnostic Interviews. Diagnostic interviews are typically considered the gold standard, the most accurate way to identify cases (Jablensky, 2002). In the studies we identified, diagnostic interviews have not been used, with the exception of one study of Dutch Army troops deployed to Iraq (Engelhard et al., 2007). No studies of U.S. servicemembers have used structured diagnostic interviews. Nineteen studies used screening tools, and three relied on diagnostic codes or other types of information from medical records. Table 3.1 lists the method each study used to identify cases of PTSD, depression, and TBI.

PTSD Checklist. To assess post-traumatic stress disorder, 14 studies used the 17-item PTSD Checklist (PCL) (Weathers et al., 1993). The scale contains 17 questions corresponding to the three clusters of DSM-IV symptoms (American Psychiatric Association, 2000): re-experiencing the event; avoiding stimuli related to the event; and *hyperarousal*, which is defined as increased arousal, such as difficulty falling or staying asleep or hypervigilance. Respondents were asked to rate the degree to which they were bothered by each symptom on a scale from 1 (not at all) to 5 (extremely) for a specified period of time, typically, over the past 30 days. Thus, the total scale value ranged from 17 to 85. There are various ways in which the scale can be used to identify respondents as likely to have PTSD, and each scoring method varies in ability to detect a case of PTSD. In our review, 11 studies required that subjects meet DSM-IV diagnostic symptom criteria: experiencing at least one intrusion (re-experiencing) symptom, three or more avoidance symptoms, and at least two hyperarousal symptoms. Symptoms were considered to have been experienced if respondents indicated that they had been bothered by each to a moderate degree. This scoring approach, which is

Table 3.1
Methods Used to Define Cases of PTSD, Depression, and TBI, by Study

Study (Table Number)	PTSD Measure	Depression Measure	TBI Measure
Hoge et al., 2004 (Table 3.2)	PCL-DSM PCL-DSM-50	PHQ-DSM PHQ-DSM+FI	
Hoge, Auchterlonie, and Milliken, 2006 (Table 3.3)	PC-PTSD	PHQ-2	
Hotopf et al., 2006 (Table 3.4)	PCL \geq 50		
Vasterling et al., 2006 (Table 3.5)	PCL-DSM-50	CES-D-9	a
Grieger et al., 2006 (Table 3.6)	PCL-DSM-50	PHQ-DSM	
Hoge et al., 2007 (Table 3.7)	PCL-DSM-50		
Seal et al., 2007 (Table 3.8)	ICD-9-CM	ICD-9-CM	
Erbes et al., 2007 (Table 3.9)	PCL \geq 50		
Kolkow et al., 2007 (Table 3.10)	PCL-DSM-50	PHQ-DSM	
Helmer et al., 2007 (Table 3.11)	Chart Abstract		
Engelhard et al., 2007 (Table 3.12)	SCID PSS		
Martin, 2007 (Table 3.13)	PC-PTSD		
Milliken, Auchterlonie, and Hoge, 2007 (Table 3.14)	PC-PTSD	PHQ-2	
Rosenheck and Fontana, 2007 (Table 3.15)	ICD-9-CM		
Lapierre, Schwegler, and LaBauve, 2007 (Table 3.16)	SPTSS	CES-D-20	
Smith et al., 2008 (Table 3.17)	PCL-DSM PCL-DSM-50		
Hoge et al., 2008 (Table 3.18)	PCL-DSM-50	PHQ-DSM+FI	b
U.S. Department of the Army, Office of the Surgeon General (MHAT-I), 2003 (Table 3.19)	N/A	N/A	
U.S. Department of the Army, Office of the Surgeon General (MHAT-II), 2005 (Table 3.20)	PCL-DSM-50	PHQ-DSM+FI	
U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command (MHAT-III), 2006a (Table 3.21)	PCL-DSM-50	PHQ-DSM+FI	

Table 3.1—Continued

Study (Table Number)	PTSD Measure	Depression Measure	TBI Measure
U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command (MHAT-IV), 2006b (Table 3.22)	PCL-DSM-50	PHQ-DSM+FI	
Abt Associates, 2006 (Table 3.23)	PCL-DSM		

^a Self-report of a head injury with loss of consciousness lasting more than 15 minutes.

^b Self-report of a head injury with either (1) loss of consciousness, (2) being dazed, confused, or “seeing stars,” or (3) not remembering the injury.

N/A = MHAT-I does not provide precise detail on the method used to define cases of PTSD and depression (see Table 3.19).

Outcome Measures for PTSD

PCL-DSM: Reporting at least 1 intrusion symptom, 3 avoidance symptoms, and 2 hyperarousal symptoms at the moderate level on PTSD Checklist.

PCL-DSM-50: PCL-DSM + total score of at least 50 (range: 17–85) on PTSD Checklist.

PCL \geq 50: Total score of at least 50 on PTSD Checklist.

PC-PTSD: Reporting 2 or more of 4 items on Primary Care–PTSD Screen.

SPTSS: An average total score of 4 or more (range: 0–10) on the Screen for Posttraumatic Stress Symptoms.

PSS: Total score of 14 (range: 0–51) on the PTSD Symptom Scale.

SCID: Structured Clinical Interview for DSM Disorders (semi-structured diagnostic interview).

ICD-9-CM: Diagnostic code of PTSD from medical records (*International Classification of Diseases, Ninth Revision, Clinical Modification*).

Outcome Measures for Depression

PHQ-DSM: Reporting 5 or more of 9 symptoms “more than half the day” or “nearly every day” in the specified time period and the presence of depressed mood or anhedonia among those symptoms on the PHQ-9.

PHQ-DSM + FI: PHQ-DSM on the PHQ-9 + self-reported functional impairment.

PHQ-2: Positive response to question on depressed mood or anhedonia.

CES-D-20: Averaged score across 20 depressive symptoms >16 (range: 0–20) on Center for Epidemiologic Studies Depression Inventory, 20-item version.

CES-D-9: Summed score across 9 depressive symptoms >4 (range: 0–9) on Center for Epidemiologic Studies Depression Inventory, 9-item version.

termed the *symptom-cluster method* (Brewin, 2005), has resulted in a sensitivity of 1.00 and specificity of 0.92, meaning that all cases of PTSD are correctly identified, but 8 percent of persons without PTSD are identified as having the disorder (Manne et al., 1998). To meet screening criteria, all but one of these studies also required that the total score be at least 50 on the entire PCL scale, raising the threshold for detecting a case considerably. Adding this latter criterion to the symptom-cluster method of scoring has not been validated against clinician diagnoses of PTSD, although its validity has been evaluated by itself. Having a total score of at least 50 on the PCL scale has a

sensitivity=0.60, meaning that 60 percent of PTSD cases are identified by the test, and a specificity=0.99, meaning that 1 percent of those without the disorder are incorrectly identified as having PTSD (Andrykowski et al., 1998). Thus, this method is more specific but less sensitive than the symptom-cluster approach, missing many cases of PTSD, and when added to the symptom-cluster approach would make the combined approach more specific but less sensitive as well.

Patient Health Questionnaire. Out of 13 studies that have assessed major depression, seven used servicemembers' self-reports on the Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 is a 9-item questionnaire that asks respondents how often they have been bothered by each of nine symptoms of depression (e.g., trouble falling or staying asleep, or sleeping too much). Response options include not at all (=0), several days (=1), more than half the days (=2), or nearly every day (=3) during a specified period of time, typically in the past two weeks. Cases of major depression can be identified when respondents report five or more of the nine items as occurring more than half the days or nearly every day, including reports of either depressed mood or *anhedonia* (defined as loss of pleasure in once-pleasurable activities). This criterion correctly identifies 73 percent of persons with major depression and 94 percent of those without major depression (Spitzer, Kroenke, and Williams, 1999) and was the scoring method used for each of the seven studies that used the PHQ-9. In addition, five of these studies required that respondents also report *functional impairment* (FI), which is defined as impairment in work, at home, or in interpersonal functioning, to be identified as cases of depression. Imposing the functional-impairment requirement in addition to reporting five or more symptoms has not been validated against clinical interviews. It is virtually inevitable, however, that these screening criteria would be less sensitive, although they may be more specific, because they raise the threshold for detecting a case. Thus, this approach would not identify a substantial number of persons with major depression, meaning that they would be excluded from prevalence estimates.

An alternative approach for using the PHQ-9 to identify cases of major depression is to require a total score of ten or above across all nine items. Using this approach, nearly all actual cases of major depression are correctly identified as having the disorder (sensitivity >0.99), although approximately 9 percent of persons without major depression are incorrectly identified as having the disorder (specificity=0.91; Kroenke and Spitzer, 2002). In our review, no studies used this more-sensitive, but less-specific, approach.

Other Instruments. In a few studies, other instruments were used to identify cases of PTSD and depression. For PTSD, Lapierre, Schwegler, and LaBauve (2007) used the Screen for Posttraumatic Stress Symptoms (SPTSS), which is rarely used and has only been validated once (established sensitivity=0.94; specificity=0.60) (Carlson, 2001). In addition to their structured diagnostic interview, Engelhard et al. (2007) used a cutoff score of 14 on the PTSD Symptom Scale (PSS) (established sensitivity=0.91; specificity=0.62; Coffey et al., 2006). While both of these tools are very sensitive, mean-

ing that they are identifying most people with PTSD correctly, the low specificities indicate that a substantial number of those without the disorder are being classified as having PTSD. For depression, one study (Vasterling et al., 2006) used the 9-item and one study (Lapierre, Schwegler, and LaBauve, 2007) used the 20-item versions of the Center for Epidemiologic Studies Depression Inventory (CES-D). The scoring methods used for both scales correctly identify the same proportion of persons with depression (established sensitivities=0.72), although the scoring method for the 9-item CES-D is better at correctly identifying persons without depression than the scoring method used with the 20-item CES-D (established specificity for 9-item CES-D=0.86; established specificity for 20-item CES-D=0.71; Santor and Coyne, 1997). Finally, one government study of Army soldiers assessed in theater does not contain the definitional criteria that would typically be included in scientific studies (Mental Health Advisory Team 1 [MHAT-I]). However, in this study, the authors write that persons had to report experiencing “several” items on the PHQ *and* report that symptoms caused functional impairment (e.g., symptoms affected their work).

Post-Deployment Health Assessment. Three studies analyzed data from the Post-Deployment Health Assessment (PDHA) and/or Post-Deployment Health Re-Assessment (PDHRA) (we define these assessments in more detail further below) (Hoge et al., 2007; Martin, 2007; Milliken, Auchterlonie, and Hoge, 2007). To identify cases of PTSD, both the PDHA and PDHRA assessments contain the Primary Care–PTSD (PC-PTSD), which is a 4-item subscale of the PCL with yes/no response options. Reporting “yes” to two of the four items can be used to identify cases with a sensitivity of 0.91 and specificity of 0.72, meaning that 91 percent of cases of PTSD are correctly identified, although 28 percent of those without PTSD screen positive for the disorder (Prins et al., 2004). The PDHA and PDHRA also contain the PHQ-2, which is a subscale of the PHQ-9, containing the two questions relating to depressed mood and anhedonia. A positive response to one of these questions is valid for identifying cases of major depression with a sensitivity of 0.83 and specificity of 0.92, meaning that 83 percent of cases of major depression are correctly identified, and 8 percent of those without the disorder screen positive for it (Kroenke, Spitzer, and Williams, 2003).

Self-Reports of Head Injury. Two studies estimated the prevalence of mild traumatic brain injury. The first (Vasterling et al., 2006) used a question that asked whether the respondent had suffered a prior head injury with loss of consciousness lasting longer than 15 minutes. The other (Hoge et al., 2008) identified respondents as having mild TBI if they reported a head injury and one of the following three conditions: (1) loss of consciousness; (2) being dazed, confused, or “seeing stars”; or (3) not remembering the injury. While some preliminary evidence suggests that these screening criteria are valid for identifying cases of mild TBI (Schwab et al., 2007), more thorough validation of these tools is needed.

Mental and Cognitive Conditions Pre-Deployment

To better interpret post-deployment mental health and cognitive conditions, it is helpful to understand the rates of mental and cognitive conditions among military personnel before their deployment. Three studies have assessed the prevalence of PTSD, depression, and/or TBI among servicemembers before their deployment to Iraq. Vasterling et al. (2006) found that approximately 75 days prior to deployment, the mean score on the PCL was 29, which is significantly lower than those cutoff values recommended to classify individuals with and without PTSD (Blanchard et al., 1996). This study did not present the percentage who met criteria for probable PTSD or depression. These authors also showed that, prior to deployment, there was no difference in the prevalence of *mild TBI*, which they defined as a head injury with loss of consciousness for more than 15 minutes, between servicemembers who later were deployed and a comparison group that were not deployed, with an estimated prevalence of mild TBI around 5 percent.

Hoge et al. (2004) assessed 2,530 Army soldiers one week before their deployment and reported that 9 percent screened positive for PTSD using the symptom-cluster method and 11 percent screened positive for depression regardless of functional impairment. Finally, in a random sample of servicemembers across the United States that excluded anyone who had already deployed to Afghanistan/Iraq, as well as those who responded to the baseline or follow-up questionnaires during deployment, 5 percent met criteria for PTSD using the symptom-cluster method of scoring the PCL prior to being deployed, although only approximately one-quarter of this sample was eventually deployed (Smith et al., 2008).

Mental and Cognitive Conditions in Theater

In July 2003 and three times thereafter (July 2004, 2005, and 2006), the U.S. Army Surgeon General chartered Mental Health Advisory Teams to produce reports on mental health issues related to deployment to Iraq. Although in the rest of the review we rely primarily on peer-reviewed publications, we include these reports also because they are the only ones that assessed the prevalence of PTSD and depression among servicemembers in theater. Note, however, that over the course of these multiple assessments in theater, the nature of the conflicts changed. As we described in Chapter Two, the first phase of OIF involved troop buildup and major combat operations, which was followed by a period of relative calm before a growth in insurgency. Thus, the nature of the risks confronting a servicemember during this conflict changed over time. The MHAT reports specifically focused on *Army brigade combat teams* in Iraq; the first two of these reports also included soldiers in Kuwait in areas with high levels of occupational stress, and the final report also included a sample of marines who served with regimental combat teams in Iraq. The MHAT reports use the PCL to identify cases of what the authors term “acute stress”—but not PTSD—to describe PTSD-like symptoms reported in a combat zone. Prevalence estimates of acute stress

were around 15 percent across all MHAT assessments, except when data were collected in 2004 (MHAT-II), when the prevalence of acute stress was around 10 percent. Rates of depression, measured with the PHQ-9, in theater also were relatively constant across the MHAT samples, with between 5 and 9 percent of troops meeting probable diagnostic criteria. Although the MHAT studies provide estimates of stress reactions experienced by servicemembers in theater, it is unclear how they relate to symptoms that emerge or continue when servicemembers are removed from the combat environment (U.S. Department of the Army, Office of the Surgeon General, 2003, 2005; U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command, 2006a, 2006b).

Mental and Cognitive Conditions Post-Deployment

The remaining studies estimated the prevalence of mental health and cognitive conditions post-deployment, but they varied with respect to the average interval between returning from deployment and assessment. Together, these studies generally reveal that the estimated prevalence of PTSD and depression increases as the time from returning from deployment increases. In addition, there are few peer-reviewed studies on TBI, leaving much unknown about the prevalence of this condition.

Prevalence estimates of PTSD and depression are available for servicemembers immediately upon their return from deployment. In April 2003, the Department of Defense (DoD) mandated that, immediately upon returning from deployment, all servicemembers complete a Post Deployment Health Assessment questionnaire. Servicemembers generally fill out these questionnaires before leaving the country in which they are deployed or within two weeks of returning home (Hoge, Auchterlonie, and Milliken, 2006). The PDHA uses the PC-PTSD and PHQ-2, which have low specificities and are therefore likely to incorrectly screen positive for PTSD and depression, respectively, many persons who do not actually have these conditions.

Three studies used data from samples that were assessed with the PDHA (Hoge, Auchterlonie, and Milliken, 2006; Martin, 2007; Milliken, Auchterlonie, and Hoge, 2007). Only one study included servicemembers returning from Afghanistan. It estimated that 5 percent of servicemembers returning from Afghanistan screened positive for PTSD (Hoge, Auchterlonie, and Milliken, 2006). All three studies indicated that approximately 10 percent of those returning from Iraq screened positive for PTSD. For depression, one study indicated that 3 percent of those returning from Afghanistan and 5 percent of those returning from Iraq screened positive on the PDHA (Hoge, Auchterlonie, and Milliken, 2006); a separate study indicated that 4 percent of the Army National Guard and reservists returning from Iraq and 5 percent of Army soldiers from the Active Component screened positive for depression on the PDHA (Milliken, Auchterlonie, and Hoge, 2007).

When troops return home, there may be a disincentive for reporting mental health symptoms on the PDHA. For example, servicemembers may worry that answer-

ing “yes” to questions about mental health problems may delay their return to their family and friends. In addition, many symptoms of psychiatric disorders may develop over time and not be present immediately upon returning. Because of this situation, in 2006 DoD began reassessing returning servicemembers three to six months after returning from deployment, using a tool similar to the PDHA, the Post-Deployment Health Reassessment. Among one cohort of 88,235 Army soldiers who completed both the PDHA and PDHRA, a greater proportion screened positive for PTSD on the PDHRA (17 percent of the Active Component and 25 percent of the Reserve Component) than on the PDHA (12 percent of the Active Component and 13 percent of the Reserve Component). The proportion screening positive for depression among this cohort also increased from 5 percent to 10 percent among Active Component Army soldiers and from 4 percent to 13 percent among members of the Army Reserve Component (Milliken, Auchterlonie, and Hoge, 2007). In separate analyses using the PDHRA, 16 percent of 96,934 servicemembers screened positive for PTSD (Martin, 2007). In this study, approximately 94 percent of those who had PDHRA assessments had PDHAs: Of those who screened positive for PTSD on the PDHRA, 30 percent had screened positive for PTSD on the PDHA. These findings mean that approximately two-thirds of persons screening positive for PTSD on the PDHRA were new cases (Martin, 2007).

In addition to those studies that used the PDHRA, two additional studies assessed the same cohort of servicemembers at multiple times post-deployment (i.e., longitudinal studies). Grieger et al. (2006) followed a cohort of wounded soldiers evacuated from combat between March 2003 and September 2004. At one month post-injury, 4 percent met criteria for PTSD and a similar proportion met criteria for depression; 2 percent met criteria for co-morbid PTSD and depression. At four months, the proportion of persons meeting criteria for PTSD and depression increased to 12 percent and 9 percent, respectively; 8 percent met criteria for co-morbid PTSD and depression, estimates that remained relatively unchanged at seven months (Grieger et al., 2006). The other longitudinal study was of soldiers from three Dutch infantry army battalions assessed at five and 15 months after returning from Iraq. In this sample, the mean level of depression was stable at both assessments, whereas the mean level of PTSD symptoms tended to be lower at 15 months than at five months (Engelhard et al., 2007).

Three post-deployment studies employed *cross-sectional survey designs*, in which subjects were interviewed only once within six months from servicemembers' returning from deployment. Hoge et al. (2004) studied the prevalence of PTSD and depression among an Army sample three or four months after returning from deployment to Afghanistan, and separate Army and Marine Corps samples three or four months after returning from deployment to Iraq. When using the symptom-cluster method to identify cases, they found that 12 percent of Army soldiers returning from Afghanistan met criteria for PTSD and 14 percent met criteria for depression, regardless of functional status. Using the same case definitions, they found that 18 percent of the

Army sample met criteria for PTSD upon returning from Iraq and 15 percent met criteria for depression; among marines, 20 percent met criteria for PTSD and 15 percent met criteria for depression upon returning from Iraq. Vasterling et al. (2006) indicate that the mean time interval between returning from deployment and assessment was 73 days, and most intervals ranged between 58 and 84 days. In this study, 12 percent met criteria for PTSD using a cutoff point of 50 in addition to the symptom-cluster scoring, and 25 percent met criteria for depression. In a separate study of Army soldiers attending a reintegration program five to eight weeks after returning from deployment, Lapierre, Schwegler, and LaBauve (2007) estimated that the prevalence of PTSD was 31 percent among those returning from Iraq and 30 percent among those returning from Afghanistan. However, as mentioned earlier in this chapter, the screening tool these researchers used includes a large number of people screening positive for PTSD who do not actually have the disorder.

The remaining studies generally assessed symptoms around one year after servicemembers' returned from deployment. When assessed at least one year after returning from Iraq and neighboring areas, 4 percent of UK servicemembers met criteria for PTSD using a cutpoint of 50 on the PCL and 20 percent met criteria for an "unspecified" [sic] common mental health condition (Hotopf et al., 2006). Studies of U.S. troops, however, produce much larger estimates. Hoge et al. (2007) found that 17 percent of Army soldiers met criteria for PTSD one year after returning home, using a cutpoint of 50, in addition to the symptom-cluster method on the PCL. Abt Associates mailed surveys between July and December 2004 to military personnel in the Active Component who had deployed to Iraq on or after January 2003 and returned from theater by February 2004, meaning that assessments generally occurred between six and 12 months after returning from deployment. Among the 43 percent of 3,329 deployed servicemembers who responded to the survey, 7 percent met screening criteria for PTSD using the symptom-cluster scoring method alone. Taken together, these studies reveal that the prevalence of both PTSD and depression seems to increase as the time from returning from deployment increases.

Three studies identified PTSD cases using medical records among U.S. veterans who served in Afghanistan or Iraq and sought medical care at the Veterans Administration (VA), a patient population likely to include servicemembers with widely ranging intervals since returning from Afghanistan or Iraq. Seal et al. (2007) reviewed records of veterans specifically from Afghanistan and Iraq who sought any type of inpatient or outpatient care at a VA health care facility between September 2001 and September 2005. Among 103,788 veterans with VA records, 13 percent had a diagnosis code for PTSD and 5 percent had a diagnosis code for depression. Helmer and colleagues (2007) reviewed charts from 56 veterans seeking care at the New Jersey War-Related Injury and Illness Center (NJ-WRIIC) from June 2004 to January 2006; definite or probable PTSD diagnoses were documented in the final impression sections of 45 percent of the abstracted charts. Rosenheck and Fontana (2007) also reviewed VA records

but were not able to specifically identify those who were veterans from Afghanistan and Iraq. Instead, their sample termed probable OEF/OIF veterans as individuals born after 1972 who had their first VA outpatient encounter occur in 1991 or after. Among these individuals, there was a 232-percent increase in PTSD diagnoses between 2003 and 2005.

The remaining four studies do not indicate when their assessments took place with respect to servicemembers' return from deployment. As with those studies using medical records, these studies are also likely to include servicemembers with widely ranging intervals since returning. Erbes et al. (2007) surveyed OEF/OIF veterans who enrolled for care at the Minneapolis VA Medical Center (MVAMC) and who were not already accessing mental health care at the VA: Of those who responded, 12 percent screened positive for PTSD. Smith et al. (2008) assessed their cohort of servicemembers twice, roughly three years apart, but they do not explicitly present the proportion of servicemembers who deployed and developed PTSD between the two assessments. Instead, they report that, among those who did not have PTSD symptoms at baseline and deployed to Afghanistan or Iraq, 9 percent of those who reported combat exposure and 2 percent of those who did not report combat exposure developed PTSD. Among those who screened positive for PTSD at baseline and were deployed, 48 percent of those who reported combat exposure met criteria for PTSD, as did 22 percent of those without combat exposure. Kolkow et al. (2007) assessed military health care workers at a Naval Medical Center, 9 percent of whom met criteria for PTSD and 5 percent of whom met criteria for depression.

Our review identified only two *peer-reviewed studies* (i.e., studies that have been subjected to review by experts in the field before they are published) that attempted to estimate the prevalence of TBI. Vasterling et al. (2006) asked respondents whether they suffered a head injury with a related loss of consciousness lasting more than 15 minutes. When assessed in 2005 at around 2.5 months after returning from deployment, 8 percent of deployed troops reported having such an injury over a period that included the duration of their deployment compared with a prevalence of 4 percent among nondeployed servicemembers over a corresponding interval. Hoge et al. (2008) estimated that, in 2006, three or four months after returning from Iraq, 15 percent of Army soldiers reported a head injury during deployment that was accompanied by loss of consciousness or altered mental status (i.e., being dazed, confused, or "seeing stars," or not remembering the injury).

The only other reference we found that indicated the prevalence of TBI among deployed servicemembers was taken from reports that document reasons for medical evacuations from Afghanistan and Iraq (Fischer and Library of Congress, 2006). As of March 31, 2006, there were 1,179 TBIs among evacuees, 96 percent of which were sustained in Iraq and 4 percent, in Afghanistan. This report, published by the Congressional Research Service, provides no information on how it defines TBI and whether these numbers represent cases of mild TBI.

The other source of information on the prevalence of TBI comes from post-deployment screenings performed at select military bases. To our knowledge, those estimates have not yet been presented in peer-reviewed publications and thus may be less reliable. According to a report described in *USA Today*, 10 percent of 7,909 marines with the 1st Marine Division at Camp Pendleton, California, suffered brain injuries and 84 percent of 500 troops who suffered concussions were still suffering symptoms an average of ten months after the injury (Zoroya, 2006). At Fort Irwin, also in California, 1,490 soldiers were screened, and almost 12 percent suffered concussions during their combat tours (Zoroya, 2006).

Emergent Themes

We identified a number of emergent themes from this literature. We discuss each below.

- *There is limited research on the prevalence of traumatic brain injury, owing to assessment difficulties, case definitions, and restrictions on the release of such information.*

Research on the prevalence of traumatic brain injury among returning troops is sparse. This may be due in part to methodological constraints that hinder efforts to estimate the prevalence of TBI in epidemiological surveys. Although identifying penetrating brain injuries is a relatively straightforward procedure, estimating the prevalence of closed head injuries (when an object hits the head but does not break the skull) and primary blast injuries (injuries caused by wave-induced changes in atmospheric pressure) is difficult, even though such injuries are anecdotally noted as extremely prevalent among returning servicemembers (Warden, 2006; Murray et al., 2005). In addition, definitions for TBI subtypes, particularly mild TBI, are relatively broad. In the two peer-reviewed studies we found that examined prevalence of brain injury, Vasterling et al. (2006) identified those with a head injury with loss of consciousness for more than 15 minutes, whereas Hoge et al. (2008) used a definition that could include loss of consciousness or altered mental status. In addition, symptoms of mild TBI often overlap with those of other conditions, including PTSD (Colarusso, 2007).

Current TBI-screening initiatives will provide useful information on the prevalence of this condition among servicemembers returning from Afghanistan and Iraq. Most notably, as of December 2007 the PDHA and PDHRA include questions regarding symptoms of mild TBI. In addition, routine TBI screenings are conducted in theater among all Army soldiers exposed to a blast, at Landstuhl Regional Medical Center in Germany among all servicemembers medically evacuated from Afghanistan or Iraq when the reason for evacuation is something other than a psychiatric diagnosis, and at Walter Reed Army Medical Center among anyone medically evacuated due to an

injury caused by a blast, motor vehicle accident, fall, or gunshot wound to head or neck (The Traumatic Brain Injury Task Force, 2007; Warden, 2006). In addition, uniform screenings are being conducted among all those returning to Fort Carson in Colorado from deployment. When released, the results of these screenings will be important sources of data, although some may have limited utility. Prevalence estimates based on screenings conducted among those who have been medically evacuated may overlook persons with mild-to-moderate closed head injuries (Warden, 2006), and those conducted among servicemembers returning to Fort Carson may not be generalizable to personnel returning to other military bases.

- *Most existing studies define cases of PTSD and depression using criteria that have not been validated, that are not commonly used in population-based studies of civilians, and that are likely to exclude a significant number of servicemembers who have these conditions.*

The majority of studies identify cases of PTSD and depression using methods that Hoge et al. (2004) term “strict” criteria but that have not been validated against clinical diagnoses. For PTSD, studies applied a combination of two approaches that have been validated independently of one another (i.e., meeting symptom-cluster criteria and requiring a total score above 50 on the PCL). As stated earlier in this chapter, imposing a cutpoint of 50 on the PCL alone correctly identifies only around 60 percent of persons who have PTSD (Andrykowski et al., 1998). For depression, most studies required that respondents report significant functional impairment in addition to DSM-IV depressive symptoms on the PHQ-9; however, even without requiring significant functional impairment, this method identifies only 73 percent of depressed cases (Spitzer, Kroenke, and Williams, 1999). The failure of these criteria alone to identify a substantial number of individuals with these two conditions who may need treatment and other services is why most epidemiological studies of civilians use criteria that is more sensitive but less specific, such as symptom-cluster criteria (e.g., Jaycox, Marshall, and Schell, 2004) or a total-score cutpoint of 44 (e.g., Zatzick et al., 2002; Walker et al., 2003) on the PCL to identify cases of PTSD, and a total cutpoint of 10 on the PHQ-9 to identify cases of probable depression (e.g., Ruo et al., 2003).

By imposing additional requirements on tools that already miss a substantial number of actual cases, we can surmise that estimates of PTSD and depression from these studies are likely underestimating the actual prevalence of these conditions. Two studies that apply two sets of criteria for identifying PTSD and one study that applies two sets of criteria for identifying cases of depression show such underestimation empirically. Using the symptom-cluster method only, Hoge et al. (2004) estimate that the post-deployment prevalence of PTSD among Army soldiers is 18 percent; it is 13 percent using the symptom-cluster method plus the 50-point cutoff. Among the same group, estimates of depression are 15 percent without and 8 percent with the

functional-impairment requirement. Smith and colleagues (2008) also report both sets of numbers for PTSD: When a cutoff score of 50 is required in addition to symptom-cluster criteria, they estimate that 8 percent of those deployed with combat exposure develop PTSD; however, when this cutoff is not required, 9 percent of those without are estimated to develop PTSD. Stringent screening criteria will miss not only actual cases of PTSD and depression but also *subthreshold cases*, individuals with symptoms of PTSD or depression who do not meet the established case definition yet who experience significant impairment. Identifying subthreshold cases of PTSD and depression is important, since interventions and treatment aimed at these cases can reduce symptomatology and prevent progression to full diagnoses (Cuijpers, Smit, and van Straten, 2007; Marshall et al., 2001).

- *Army soldiers were the most-frequently sampled servicemembers, although most studies employed convenience samples, which are not generalizable to the total deployed force.*

Army soldiers make up the largest share of military personnel in Afghanistan and Iraq (O'Bryant, 2006, 2007) and also are the servicemembers most frequently studied with respect to deployment-related mental and cognitive health. Among studies of U.S. servicemembers, almost half focused exclusively on Army soldiers (i.e., Grieger et al., 2006; Vasterling et al., 2006; Hoge et al., 2007; Milliken, Auchterlonie, and Hoge, 2007; Lapierre, Schwegler, and LaBauve, 2007; Hoge et al., 2008; and U.S. Department of the Army, Office of the Surgeon General, 2003, 2005; U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq, and Office of the Surgeon General, U.S. Army Medical Command, 2006a). Three studies focused on samples of only Army soldiers and marines (Hoge et al. 2004; Hoge, Auchterlonie, and Milliken; and U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq, and Office of the Surgeon General, 2006b). The remaining seven studies either examined medical records or drew samples from all deployed armed-forces personnel accessing medical care in the VA (Seal et al., 2007; Rosenheck and Fontana, 2007; Erbes et al., 2007; Helmer et al., 2007) or were samples that contained members from all services (Martin, 2007; Smith et al., 2008; Abt Associates, 2006).

With respect to military component, most studies contained a mix of servicemembers from the Reserve and Active Components, although the Reserve Component was generally underrepresented with respect to the total deployed force. One study (Abt Associates, 2006) sampled only members of the Active Component; we suspect that four additional studies restricted their samples to members of the Active Component, although the authors did not provide specific information to make this distinction (Hoge et al., 2004; Vasterling et al., 2006; Hoge et al., 2007; Lapierre, Schwegler, and LaBauve, 2007). Two of these indicated that they sampled “active duty” soldiers (Vasterling et al., 2006; Lapierre, Schwegler, and LaBauve, 2007); however, because

Reserve/National Guard personnel are considered “activated” and therefore on “active duty” when deployed, these terms are ambiguous for making this distinction.

Only a handful of studies can be considered generalizable to all troops deployed to Afghanistan or Iraq. Studies that used the PDHA (Hoge, Auchterlonie, and Milliken, 2006) or the PDHA combined with the PDHRA (Martin, 2007; Milliken, Auchterlonie, and Hoge, 2007) should be generalizable to the larger population of servicemembers they represent, because completion of these assessments is required by DoD. However, Martin (2007) could only identify 77 percent of PDHAs among servicemembers returning from Iraq in 2005, and that fewer males, servicemembers of younger ages, members of the Marine Corps and Navy/Coast Guard, and members of the Active Component completed these assessments than did their counterparts.

Three studies used surveys administered to random samples of servicemembers: U.S. military personnel from the Active Component (Abt Associates., 2006), UK servicemembers (Hotopf et al., 2006), and all U.S. military personnel (Smith et al., 2008). Each of these population-based studies of servicemembers suffers from low participation rates (49 percent in the study by Abt Associates, 2006; 61 percent in Hotopf et al., 2006; and 36 percent in Smith et al., 2008). In the UK sample (Hotopf et al., 2006), younger servicemembers, males, members of the Air Force and Navy, noncommissioned officers, reservists, and non-Whites were less likely to respond than were their counterparts; however, these authors adjusted for these differential response rates when presenting their results. In contrast, the study of all U.S. military personnel (Smith et al., 2008) oversamples females, those previously deployed, and Reserve/National Guard personnel, and also overrepresents Air Force personnel relative to the actual deployed U.S. force; in presenting their results, the authors make no efforts to adjust for this sampling design.

Most of the other studies used convenience samples or reviewed the medical records of those in treatment contact, two methods that systematically exclude important segments of the population. For instance, samples were focused on specific military *units* that were scheduled to be deployed or likely to be deployed (Hoge et al., 2004; Vasterling et al., 2006), were deployed with a high likelihood of combat exposure or operational stress (MHATs I–IV, U.S. Department of the Army, Office of the Surgeon General, 2003, 2005; U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq, and Office of the Surgeon General, U.S. Army Medical Command, 2006a, 2006b), or had returned from deployment (Hoge et al., 2004; Hoge et al., 2007; Lapierre, Schwegler, and LaBauve, 2007). Studying military units post-deployment is likely to exclude servicemembers who are at highest risk for mental health problems, such as those with severe injuries or those who have separated from military service. In addition, Hotopf et al. (2006) hypothesize that sampling procedures may be the underlying reason why rates of PTSD in the UK sample are so much lower than among the U.S. samples. They suggest that the U.S. samples may focus on troops more likely to have combat roles than a random sample of all servicemembers

that encompasses those in both combat service and combat service support (units that provide operational and logistical support, respectively, to combat elements) (Hotopf et al., 2006). Studies relying on chart reviews or samples drawn from servicemembers seeking treatment in the VA also have limited generalizability because they do not include veterans who do not seek care at the VA.

In addition to these studies' limited generalizability, most studies suffer from other limitations common to many epidemiological studies. For example, for all of the post-deployment studies, individuals with the most significant mental health problems may be unavailable, unable, or unwilling to participate in the survey, a bias that leads to more-conservative estimates of prevalence than is actually the case. On the other hand, the healthiest servicemembers may be those who are deployed more than once, and therefore less likely to be surveyed during a post-deployment assessment. If this is the case, these studies would yield overestimates of the prevalence of these conditions.

The same problem applies to longitudinal studies, for which those persons lost to follow-up are likely to be systematically different from those who participated in follow-up assessments. Both studies that analyzed data from the PDHRA present the proportion of those with PDHRAs who had completed PDHAs, but neither presents the proportion of those with PDHAs who are missing PDHRAs, and it is unclear who is being missed in the PDHRA (Martin, 2007; Milliken, Auchterlonie, and Hoge, 2007). Other longitudinal studies also suffered from attrition. Only 72 percent of deployed soldiers participated in the second wave of the study of post-deployment neuropsychological outcomes by Vasterling et al. (2006). Separation from military service was the most common reason for nonresponse in that sample; also, many did not respond because they were redeployed or on leave. In the sample of wounded servicemembers, 72 percent of those interviewed at wave 1 were assessed at wave 2 (four months), 61 percent were assessed at wave 3 (seven months), and only 50 percent were interviewed at all three assessments; the authors report no differences in probable PTSD or depression at one month among those lost to follow-up (Grieger et al., 2006). Finally, in the cohort study by Smith and colleagues (2008), more than 25 percent of the study sample was lost to follow-up at the year 3 assessment.

- *Regardless of the sample, measurement tool, or time of assessment, combat duty and being wounded were consistently associated with positive screens for PTSD.*

Many studies asked servicemembers about combat exposure, such as having been shot at, handling dead bodies, knowing someone who was killed, killing enemy combatants, or discharging one's weapon. When measures such as these were included in multivariate regression models, they were consistently associated with increased likelihood of screening positive for PTSD (Grieger et al., 2006; Hoge, Auchterlonie, and Milliken, 2006; Hoge et al., 2004; Hotopf et al., 2006; Kolkow et al., 2007; U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq, 2006b).

In addition, Smith et al. (2008) found that, for persons without PTSD at baseline who were deployed, 9 percent of those who were exposed to combat reported symptoms of PTSD at follow-up versus 2 percent of those who did not report combat exposures. Given the changing nature of risks confronting servicemembers during these conflicts (see Chapter Two), servicemembers from different deployment cycles may report different exposures and rates of PTSD.

The longitudinal study of wounded soldiers indicates, however, that the effect of combat exposure on PTSD may vary as the time from returning from deployment increases, because combat exposure was associated with PTSD one month after injury but not at four or seven months (Grieger et al., 2006). Similarly, combat exposure may differ by deployment to Afghanistan or Iraq: Hoge, Auchterlonie, and Milliken (2006) found that combat experience was only associated with PTSD in the sample of servicemembers deployed to Iraq but not Afghanistan. In contrast, combat exposure was only associated with depression in one of 11 studies that contained measures of depression (U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq, 2006b). Having suffered an injury or being wounded was also associated with an increased likelihood of PTSD across studies (Hoge, Auchterlonie, and Milliken, 2006; Hoge et al., 2004; Hoge et al., 2007). Among soldiers who were wounded, those with more severe physical symptoms were most likely to have PTSD and depression at four and seven months post-injury, and more severe physical symptoms at one month predicted PTSD at seven months (Grieger et al., 2006).

Aside from these consistent correlates of PTSD, studies also highlighted features that appeared to increase the risk of PTSD or depression among their samples. Young age, such as being under 25, was associated with PTSD in two studies (Grieger et al., 2006; Seal et al., 2007), although those younger than 20 were *least likely* to screen positive for PTSD in analyses using the PDHA (Martin, 2007). In MHAT-I (U.S. Department of the Army, Office of the Surgeon General, 2003) and in the study by Abt Associates (2006), reports of low personal and unit morale and lower unit cohesion were linked to increased reports of PTSD symptoms. Some studies that examined differences by component found that reservists often were more likely to report symptoms of PTSD than members of the Active Component (Milliken, Auchterlonie, and Hoge, 2007; Martin, 2007; Helmer et al., 2007). Junior enlisted servicemembers may also be at increased risk for PTSD (Martin, 2007; Smith et al., 2008) and TBI (Hoge et al., 2008) relative to more senior ranking servicemembers. In one study, medical officers faced an increased risk of developing PTSD (Martin, 2007). Finally, having been deployed more than once was associated with acute stress in the two later MHAT reports, when data were collected in 2005 and 2006; multiple deployments were associated with depression in the MHAT-III report (data collected in 2005); and being deployed for more than six months was associated with both acute stress and depression in the final MHAT report, conducted in fall 2006 (U.S. Department of the Army,

Office of the Surgeon, Multinational Force–Iraq, and Office of the Surgeon General, U.S. Army Medical Command, 2006a, 2006b).

- *When comparisons are available, servicemembers deployed to Iraq appear to be at higher risk for PTSD than servicemembers deployed to Afghanistan.*

Many studies attempted to draw comparisons between groups of servicemembers to identify variables associated with differences in the prevalence of disorders across groups. In studies that included servicemembers deployed to Afghanistan, Iraq, or another location, those deployed to Iraq were consistently more likely to report PTSD, although such reports are likely due to the increased likelihood of combat exposure among servicemembers in Iraq (Abt Associates, 2006; Hoge, Auchterlonie, and Milliken, 2006; Hoge et al., 2004; Lapierre, Schwegler, and LaBauve, 2007; U.S. Department of the Army, Office of the Surgeon General, 2005). The results of the MHAT reports were compared with each other to discern whether, over the period in which the four studies were conducted, rates of PTSD and depression increased or decreased among servicemembers in theater. Among Army soldiers interviewed in 2004 (MHAT-II) rates of PTSD were lower than they were when interviewed in 2003 (MHAT-I), although rates of depression were not significantly different. There were no differences between rates of either PTSD or depression in MHAT-I and MHATs III and IV.

Other studies attempted to investigate whether deployment has a *causal* influence on PTSD and depression. To properly conduct such an assessment would involve a longitudinal study among a cohort of soldiers assessed both before and after deployment, and preferably a control group that did not deploy, to ensure that there is no effect unrelated to deployment over the specified interval. Only two studies were designed in this way. One of them (Vasterling et al., 2006) did not present whether the prevalence of PTSD or depression increased among the sample post-deployment. Smith et al. (2008), on the other hand, did show that, among those who did not have PTSD at baseline, those who deployed were three times more likely to develop PTSD than those who did not deploy.

Other studies have compared rates of PTSD and depression across different samples to assess whether rates of these outcomes are different among those who have served in Afghanistan or Iraq and those about to be deployed (Hoge et al., 2004), or among servicemembers who were not deployed at the same time (Abt Associates, 2006; Hotopf et al., 2006). Hoge et al. (2004) found that Army and Marine Corps units assessed after returning from deployment to Iraq had higher rates of PTSD and depression than an Army unit scheduled to deploy to Iraq in one week's time. The Abt Associates study (2006) found that 7 percent of deployed military personnel from the Active Component screened positive relative to 4 percent of nondeployed Active Component personnel, and that the average value across all items on the PCL was also higher among deployed servicemembers than among the nondeployed group. On

the other hand, Hotopf and colleagues (2006) found no difference in PTSD or other mental health outcomes among deployed and nondeployed servicemembers from the United Kingdom. None of these studies adjusted for differing baseline characteristics, which may make one group more likely than the other to report mental health or cognitive conditions. Thus, although the studies have provided evidence that the prevalence of PTSD and depression is greater post-deployment, no study has yet been able to provide evidence of a causal relationship.

Discussion

Assembling and critically reviewing the existing epidemiological studies that have examined mental and cognitive conditions among servicemembers deployed to Afghanistan and Iraq allowed us to address several specific objectives of the current chapter. Below, we describe consistencies and inconsistencies across studies, identify the strengths and weaknesses of the studies, and conclude by proposing future research directions.

Consistencies and Inconsistencies Across Studies

The assembled research to date on the prevalence of post-combat mental health and cognitive conditions among servicemembers deployed to Afghanistan and Iraq supports five broad generalizations.

First, PTSD is more prevalent than depression among deployed servicemembers, and it affects roughly 5 to 15 percent of servicemembers, depending on who is assessed and when they are assessed; the prevalence of depression among servicemembers ranges from 2 to 10 percent, also depending on when assessment occurs and who is assessed. We acknowledge that some studies have yielded prevalence estimates that extend beyond these intervals and have chosen these intervals from the group of studies as a whole, relying more heavily upon those that we consider most representative of the deployed population and considering carefully the methods that study authors used to identify cases. Second, many studies employ the same screening tools, making prevalence estimates across studies generally comparable. Therefore, variability across studies is likely due to differences in study samples or the time of assessment. However, the criteria used across most of these studies to identify PTSD and depression have not been validated and do not identify a substantial portion of those who actually have these conditions. Third, because different studies have been conducted at different periods during deployment and post-deployment, comparing across studies suggests that the prevalence of PTSD and depression increases as the time since returning from deployment increases. Fourth, across studies, servicemembers who experience combat exposure and who have been wounded are more likely to meet criteria for PTSD. Fifth, servicemembers deployed to Afghanistan and Iraq are more likely to meet criteria for PTSD and depression than nondeployed troops, although

those deployed to Iraq have higher rates of PTSD and depression than those deployed to Afghanistan.

For the purposes of allocating funds and services, policymakers will want to know how many returning servicemembers will likely meet diagnostic criteria for PTSD, depression, and TBI by the end of OEF and OIF, and whether or not these individuals sought treatment or can be persuaded to seek treatment. This number will help inform projections of workforce and capacity requirements for meeting potential demand. Providing this number, however, is difficult, owing to the methodological limitations of the epidemiological studies we have reviewed. Studies with the most-sensitive screening criteria have not been conducted among samples representative of the entire deployed population, and those studies that are most generalizable (Hoge, Auchterlonie, and Milliken, 2006; Martin, 2007; Milliken, Auchterlonie, and Hoge, 2007) use a screening tool that is likely to incorrectly identify some persons without PTSD or depression as having these conditions.

If we apply the range of prevalence estimates for PTSD (5 to 15 percent) and depression (2 to 10 percent) to the 1.64 million servicemembers who have already been deployed, we can estimate that the number of servicemembers returning home with PTSD will range from 75,000 to 225,000 and with depression, from 30,000 to 150,000. The precise number depends on how many of all deployed servicemembers are at increased risk for these outcomes—specifically, the percentage of those deployed with direct combat experience, those who have been wounded, and the military service of which they are a part. Note, however, that the most-generalizable studies estimated that the prevalence of PTSD fell almost midway in this range and at the lower end of the range for depression. If we were to use the median value between the range of servicemembers likely to have PTSD, we would arrive at a figure of 150,000. As we reiterate throughout this chapter, we do not yet have a sound basis for estimating numbers for TBI.

Strengths and Limitations of the Existing Studies

From a methodological perspective, these studies all have strengths that should be noted and replicated in future studies. As mentioned above, researchers often use the same screening tools and screening criteria, enabling comparisons across samples. Thus, although samples differ, we can examine studies collectively and draw general conclusions (e.g., that the prevalence of disorders increases over time or is greater for one group than for another). In addition, the current research tends to focus on combat troops. This group may warrant special attention to the extent that it has disproportionately higher levels of combat exposure: Studies from broader deployed populations indicate that those with combat exposure are more likely to have PTSD and may be more likely to have depression. However, focusing exclusively on combat troops is also a limitation. First, as argued by Hotopf et al. (2006), sampling combat troops creates samples that are not representative of the entire deployed force; if combat exposure is

higher among this group, such sampling can yield estimates of PTSD and depression that are inflated. On the other hand, combat exposure can include being caught in an ambush or handling dead bodies, which may be just as prevalent, if not more so, among supply personnel or combat medics, respectively.

Despite these strengths, if the reviewed studies are to guide the allocation of mental health services for military personnel in the United States it is imperative that two common limitations of these studies, and the implications that these limitations have on prevalence estimates, be recognized. First, in all but a handful of studies (Abt Associates, 2006; Martin, 2007; Milliken, Auchterlonie, and Hoge, 2007; Hoge, Auchterlonie, and Milliken, 2006; Hotopf et al., 2006), generalizability is weak. This weakness means that prevalence estimates are specific to the servicemembers in the respective samples. The current samples, including longitudinal assessments that are considered to be the most generalizable (Martin, 2007; Milliken, Auchterlonie, and Hoge, 2007), are likely to exclude servicemembers with the highest likelihood of mental problems, such as those with serious injuries or those who have separated from military service. This type of bias is likely to yield *lower* prevalence estimates than are actually the case. On the other hand, the healthiest troops may be systematically excluded from some surveys because they are being deployed multiple times and may therefore not be included in post-deployment samples. In addition, by focusing on troops most likely to be in combat situations, current studies may also be systematically excluding those servicemembers deployed but serving in combat support or combat services support roles. These other biases may therefore yield prevalence estimates *higher* than are actually the case. We discuss below one strategy for addressing these types of biases: surveying a random sample of all deployed servicemembers.

Second, most of the current studies used screening tools to measure the prevalence of mental health and cognitive conditions. Screening tools are typically short and simple to administer, but they are not equivalent to diagnostic procedures. The methods used to identify cases of PTSD, depression, and TBI with these screening tools in most studies have not been validated, and they miss a significant number of those persons with these mental and cognitive conditions, thereby producing estimates that could potentially underestimate the actual prevalence of these conditions. While fully or semi-structured diagnostic instruments are improvements upon screening tools for diagnosing individuals with disorders, these methods may also have problematic sensitivity and specificity (Kendler et al., 1996). They may also be impractical for community-based epidemiological surveys, although they can be used as the second stage of a two-phased design for those persons identified as probable cases via a screening tool (Jablensky, 2002).

Future Research Directions

We have reviewed what we believe to be the “first wave” of epidemiological studies designed to assess psychological problems among servicemembers in theater, immediately upon their return, and closely thereafter. These studies are a significant advance in both psychiatric epidemiology and military medicine. Future studies should use them to guide their research designs, but they also should improve upon them by addressing the limitations noted above. Specifically, epidemiologists and those conducting epidemiological studies should address four specific gaps in the current research:

- 1. Epidemiological studies should employ random-sample designs to generalize to all deployed servicemembers.**

Targeted research on troops engaged in combat is warranted and important. However, research on representative samples of all deployed servicemembers, regardless of their duties during deployment is encouraged to provide prevalence estimates that can be generalized to all deployed servicemembers. These studies should be designed to accurately measure differences in outcomes across relevant subgroups (e.g., those in the Active and Reserve Components). Sufficient attention should be paid to, for example, characteristics of nonresponders, so that the researchers understand who they are excluding from their study and how such individuals differ from their study sample. In addition, study samples should be compared with the larger populations they are designed to represent, and researchers should use the appropriate statistical methods to ensure that their samples and the estimates they publish are not biased by their study designs.

From a policy perspective, these advancements will aid in the correct allocation of mental health services for military personnel. In addition, future research should make targeted efforts to engage deployed servicemembers who are no longer active in the military, including those who have separated and those who have suffered significant wounds. Together, these efforts will confront those issues that are likely to yield biased estimates among the extant studies.

- 2. Researchers should use caution when defining cases to ensure that their case definition serves the larger purpose of the study.**

From a public health perspective, epidemiological studies of prevalence help guide the allocation of resources to ensure that care and support are available at the level at which it is needed. Highly specific screening tools are attractive because most people without a given disorder are correctly identified as such. But for PTSD and depression, highly specific tools often come at the cost of low sensitivity. As a result, many persons who actually have PTSD or depression are not correctly classified as having these disor-

ders. Researchers should think critically about the method they use to define cases and choose a technique that is in line with the ultimate goal of their research.

3. Research should address causal associations between deployment and subsequent mental health problems.

Studies have been conducted on servicemembers pre-deployment, in theater, and post-deployment, and some have compared rates of mental health problems at these different stages of service. Two studies (Vasterling et al., 2006; Smith et al., 2008) examined cohorts of servicemembers from a period pre-deployment to post-deployment, but both have significant limitations. A quasi-experimental research design that assesses the same servicemembers prior to deployment and post-deployment and an adequately defined control group will aid in determining the extent to which the risk of developing adverse mental and cognitive outcomes increases after serving in a conflict. Results of studies of servicemembers in theater indicate that multiple deployments and length of deployment may be associated with acute stress reactions. To reflect this situation, future studies should be designed to investigate whether these factors also increase the risk of PTSD, depression, or TBI when servicemembers return from being deployed.

4. Research should directly examine the prevalence of traumatic brain injury and its associated impairments.

Finally, although traumatic brain injury has been deemed a “signature” wound of the current conflicts, data on the prevalence of traumatic brain injury are lacking. Results from screenings at Camp Pendleton and Fort Irwin have not been subjected to the peer-review process, and it is not clear how these samples generalize to other servicemembers. Researchers should agree on a standardized definition of TBI or subtypes of TBI, such as mild TBI, investigate the psychometric properties of screening instruments used to identify these cases, and discern whether they are reliable and valid. Significant efforts are needed to identify cases of TBI—particularly mild TBI—in epidemiological surveys, as well as to identify ways to assess any impairments that result from TBI. Analysis and publication of prevalence data from TBI screens among servicemembers returning from deployment will be crucial for understanding the burden that brain injury poses on the U.S. military and society at large.

Conclusion

The studies identified in this critical review represent substantial advances in our understanding of PTSD and depression among servicemembers immediately after serving in war. Mental-health outreach and service allocation for deployed troops should occur both in theater and immediately upon the troops’ return home, given the relatively

high rates of problems shown here. Targeted interventions should focus on those who served in combat roles and those who are physically wounded. In addition, research conducted many years after previous conflicts, such as Vietnam (Dohrenwend et al., 2006) and the first Gulf War (Stimpson et al., 2003), have produced prevalence estimates equal to if not higher than those presented here, which may be due to the emergence of symptoms over time (i.e., a “delayed onset” PTSD) or increases in treatment-seeking behaviors. We hypothesize that, regardless of its cause, the need for mental health services for servicemembers deployed to Afghanistan and Iraq will increase over time, given the prevalence of information available to date and prior experience with Vietnam. Policymakers may therefore consider the figures presented in these studies to underestimate the burden that PTSD, depression, and TBI will have on the agencies that will be called upon to care for these servicemembers now and in the near future.

Table 3.2

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Hoge et al., 2004

Hoge C. W., C. A. Castro, S. C. Messer, D. McGurk, D. I. Cotting, and R. L. Koffman. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *New England Journal of Medicine*, Vol. 351, No. 1, 2004, pp. 13–22.

Type of Report (e.g., peer-reviewed, government report): Peer-reviewed

N: 6,201

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Convenience sample of 3 Army units and 1 Marine Corps unit in 2003	Anonymous survey administered to: 1 Army unit 1 week before deployment to Iraq ($n=2,530$); 1 Army unit 3–4 months after deployment to Iraq ($n=894$); 1 Marine Corps Unit 3–4 months after deployment to Iraq ($n=815$); 1 Army unit 3–4 months after deployment to Afghanistan ($n=1,962$)	PTSD: PCL-DSM ^a PCL-DSM-50 ^a Depression: PHQ-DSM ^b PHQ-DSM+FI ^b Other: Current stress, emotional problems, alcohol misuse, family problems, use of professional mental health services in the past month or year, barriers to mental health treatment	PTSD: (DSM %/DSM-50 %) Pre-Iraq Army: 9.4/5.0 Post-Iraq Army: 18.0/12.9 Post-Iraq Marine Corps: 19.9/12.2 Post-Afghanistan Army: 11.5/6.2 Depression: (DSM %/DSM-50 %) Pre-Iraq Army: 11.4/5.3 Post-Iraq Army: 15.2/7.9 Post-Iraq Marine Corps: 14.7/7.1 Post-Afghanistan Army: 14.2/6.9	Combat experience (being shot at, handling dead bodies, knowing someone who was killed, or killing enemy combatants) was strongly correlated with PTSD Being wounded or injured was positively associated with rates of PTSD	Units assessed after deploying to Iraq were significantly more likely to report experiencing PTSD and depression than units assessed before deploying to Iraq and units assessed after deploying to Afghanistan	Comparison groups: Pre-deployed and post-deployed groups are different samples; baseline distress may be heightened immediately before deployment Generalizability: Sample excludes severely wounded or those who may have been removed from units; not randomly selected Outcomes: Self-report

^a PCL-DSM—Reporting at least 1 intrusion symptom, 3 avoidance symptoms, and 2 hyperarousal symptoms at the moderate level on PTSD Checklist. PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

^b PHQ-DSM—Reporting 5 or more of 9 symptoms “more than half the day” or “nearly every day” in the specified period and the presence of depressed mood or anhedonia among those symptoms on the PHQ-9.

PHQ-DSM+FI—PHQ-DSM on the PHQ-9 + self-reported functional impairment.

Table 3.3

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Hoge, Auchterlonie, and Milliken, 2006

Hoge, C. W., J. L. Auchterlonie, C. S. Milliken. Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *Journal of the American Medical Association*, Vol. 295, No. 9, 2006, pp. 1023–1032.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 303,905

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
All Army and Marine Corps units who returned from deployment from Afghanistan, Iraq, or other locations between May 1, 2003, and April 30, 2004	Survey and administrative records: PDHA linked with administrative data on health care visits among military personnel who served in Afghanistan ($n=16,318$), Iraq ($n=222,620$), and other locations ($n=64,967$)	<p>PTSD: PC-PTSD^a</p> <p>Depression: PHQ-2^b</p> <p>Other: Other mental health problem (from PDHA), referral for an MH reason (from PDHA), health care utilization (from administrative records), attrition from military service (administrative records)</p>	<p>PTSD: Iraq: 9.8 Afghanistan: 4.7 Other: 2.1</p> <p>Depression: (% report 1 item/ % report both items) Iraq: 4.5/1.6 Afghanistan: 2.5/1.0 Other: 1.9/0.8</p>	<p>Combat experience (witnessing person being wounded or killed or engaging in direct combat during which they discharged their weapon) was positively associated with PTSD among OIF veterans</p> <p>Hospitalization during deployment was associated with a mental health problem</p> <p>Female OIF veterans were slightly more likely to report a mental health concern</p>	Deployment to Iraq rather than to Afghanistan or other locations was associated with increased odds of reporting any mental health concern	<p>Outcomes: Self-report, and screening tools with low specificity</p> <p>Generalizability: Unknown</p>

NOTES: MH—mental health; PDHA—Post-Deployment Health Assessment (survey for all military personnel conducted immediately upon returning from any deployment).

^a PC-PTSD—Reporting 2 or more of 4 items on Primary Care–PTSD (PC-PTSD) Screen.

^b PHQ-2—Positive response to question on depressed mood or anhedonia.

Table 3.4

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Hotopf et al., 2006

Hotopf, M., L. Hull, N. T. Fear, T. Browne, O. Horn, A. Iversen, M. Jones, D. Murphy, D. Bland, M. Earnshaw, N. Greenberg, J. H. Hughes, A. R. Tate, C. Dandeker, R. Rona, and S. Wessely. The health of UK military personnel who deployed to the 2003 Iraq war: A cohort study. *Lancet*, Vol. 367, No. 9524, 2006, pp. 1731–1741.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 10,272

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
UK armed forces personnel (Royal Navy including Royal Marine Corps, Army, Royal Air Force) who served in Iraq or surrounding areas between January 18 and June 28, 2003, and a comparison group of nondeployed servicemembers on March 31, 2003	Questionnaire administered to a random sample of regular servicemembers and reservists: Deployed sample ($n=4,722$) Nondeployed sample ($n=5,550$)	PTSD: $PCL \geq 50^a$ Unspecified mental health condition: Score of 4 or greater on the General Health Questionnaire-12 Other: Alcohol-use disorders; service information; experiences before, on, and after deployment; current health, background info (including past med history and adversity in early life)	PTSD Deployed: 4% Nondeployed: 4% Common mental health condition Deployed: 20% Nondeployed: 20%	Combat duties were associated with increased rates of PTSD symptoms No evidence that later deployments, which were associated with escalating insurgency and UK casualties, were associated with poorer MH outcomes	In general, there were no significant differences in PTSD and other mental health outcomes for deployed and nondeployed servicemembers Reservist status modified the effect of deployment: Deployed reservists were more likely to report common mental health conditions and fatigue than were nondeployed reservists, although this difference was not seen for regular servicemembers	Outcomes: Self-report Response rate: 61%; response rates were lower for those who were younger, male, non-officers, reservists, and nondeployed

^a $PCL \geq 50$ —Total score of at least 50 on the PTSD Checklist.

Table 3.5

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Vasterling et al., 2006

Vasterling, J. J., S. P. Proctor, P. Amoroso, R. Kane, T. Heeren, R. F. White. Neuropsychological outcomes of Army personnel following deployment to the Iraq war. *Journal of the American Medical Association*, Vol. 296, No. 5, 2006, pp. 519–529.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 1,457

Design (e.g., cross-sectional, longitudinal, medical-record review): Longitudinal

Conditions Studied: PTSD, Depression, TBI

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Random sample of soldiers of Army battalion-level units originating in Fort Hood, Texas, and Fort Lewis, Washington, assessed before deployment to Iraq (April–December 2003) and post-deployment (January–May 2005) and a nondeployed comparison group (assessed at the same times)	Assessments conducted by a civilian examiner team at military installations at two time points: Before deployment to Iraq ($n=1,368$), after deployment to Iraq ($n=1,028$). After exclusions, total $n=961$ (654 categorized as deployed and 307 categorized as nondeployed)	<p>PTSD: PCL-DSM-50^a</p> <p>Depression: Center for Epidemiological Studies Depression Inventory, 9-item version (CES-D-9)^b</p> <p>TBI: Self-reported head injury with a loss of consciousness lasting more than 15 minutes</p> <p>Other: Functional neurocognitive health, deployment experiences, state affect, performance-based neuropsychological tests</p>	<p>PTSD Deployed: 11.6%</p> <p>Depression Deployed: 25.0%</p> <p>Head injury with related loss of consciousness Deployed: 7.6% Nondeployed: 3.9%</p>	N/A	N/A	<p>Comparison groups: Rates of PTSD and depression not presented for nondeployed</p> <p>Outcomes: Self-report; validity of measure for TBI does not include nonconcussive blast exposures</p> <p>Retention: Most of those lost to follow-up had separated from military service and may be more likely to have mental or cognitive conditions</p>

NOTE: N/A—not available.

^a PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

^b CES-D-9—Summed score across 9 depressive symptoms >4 (range: 0–9) on Center for Epidemiologic Studies Depression Inventory, 9-item version.

Table 3.6

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Grieger et al., 2006

Grieger, T. A., S. J. Cozza, R. J. Ursano, C. Hoge, P. E. Martinez, C. C. Engel, H. J. Wain. Posttraumatic stress disorder and depression in battle-injured soldiers. *American Journal of Psychiatry*, Vol. 163, No. 10, 2006, pp. 1777–1783.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 613

Design (e.g., cross-sectional, longitudinal, medical-record review): Longitudinal

Conditions Studied: PTSD, Depression

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Convenience sample of Army soldiers wounded in combat and evacuated to Walter Reed Army Medical Center between March 2003 and September 2004	Survey administered to the same cohort three times after the injury: 1 month ($n=613$); 4 months ($n=395$); 7 months ($n=301$). 243 (50%) soldiers completed all three assessments.	PTSD (past month): PCL-DSM-50 ^a Depression (past 2 weeks): PHQ-DSM ^b Other: War exposure, deployment length, somatic-symptom severity	PTSD 1 month: 4.2% 4 months: 12.2% 7 months: 12.0% Depression 1 month: 4.4% 4 months: 8.9% 7 months: 9.3% PTSD + Depression 1 month: 2.0 4 months: 7.6% 7 months: 6.3% In the longitudinal cohort, 78.8% (26 of 33) of those positive for PTSD or depression at 7 months screened negative for both conditions at 1 month	At 1 month: Under age 25 more likely to meet PTSD and depression criteria than over 25; married soldiers more likely to meet criteria for PTSD and depression than unmarried; high combat exposure more likely to meet PTSD criteria, not depression High levels of physical problems were associated with increased odds of PTSD and depression at 1 month, 4 months, and 7 months Sociodemographics and combat exposure not associated with PTSD or depression at 4 or 7 months Longitudinal sample: Among those without PTSD/depression at 1 month, high levels of physical problems at 1 month predicted PTSD and depression at 7 months	N/A	Generalizability: Sample is severely injured, with low numbers of female soldiers and exclusion of patients with low cognitive abilities Retention: 72% at 4 months, 60% at 7 months. Bias if nonrespondents/those lost to follow-up are significantly different from those who were assessed Outcomes: Self-report

NOTE: N/A—not available.

^a PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

^b PHQ-DSM—Reporting 5 or more of 9 symptoms “more than half the day” or “nearly every day” in the specified period and the presence of depressed mood or anhedonia among those symptoms on the PHQ-9.

Table 3.7

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Hoge et al., 2007

Hoge, C. W., A. Terhakopian, C. A. Castro, S. C. Messer, and C. C. Engel. Association of posttraumatic stress disorder with somatic symptoms, health care visits, and absenteeism among Iraq war veterans. *American Journal of Psychiatry*, Vol. 164, No. 1, 2007, pp. 150–153.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 2,863

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Convenience sample of 4 Army combat infantry brigades deployed to Iraq	Anonymous survey administered 1 year after returning from deployment to Iraq	PTSD (past month): PCL-DSM-50 ^a Other: Alcohol misuse, self-rated health status, sick- call visits, missed workdays, somatic symptoms	PTSD: 16.6%	Injury was associated with higher rate of PTSD	PTSD was associated with lower perceptions of general health, more sick-call visits, missed workdays, more physical symptoms, and higher somatic- symptom severity	Outcomes: Self- report Generalizability: Sample based only on soldiers from combat infantry units; sample not randomly selected and may, by design, exclude severely injured/medically ill

^a PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

Table 3.8

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Seal et al., 2007

Seal, K. H., D. Bertenthal, C. R. Miner, S. Sen, and C. Marmar. Bringing the war back home: Mental health disorders among 103,788 US veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs facilities. *Archives of Internal Medicine*, Vol. 167, No. 5, 2007, pp. 476–482.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 103,788

Design (e.g., cross-sectional, longitudinal, medical-record review): Medical-record review

Conditions Studied: PTSD, Depression

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
OEF/OIF Afghanistan/Iraq veterans receiving care in the VA between September 30, 2001, and September 30, 2005	Medical-record review of new users of the VA health care system included in the VA OEF/OIF roster database; thus, all participants have been separated from service in Afghanistan/ Iraq, adjusted to maximize likelihood that VA visit occurred post- deployment	ICD-9-CM ^a mental health diagnoses codes	PTSD : 13% Depression : 5% Other : 25% received mental health diagnosis(es), 56% of whom had ≥2 distinct MH diagnoses	Younger OEF/OIF Afghanistan/Iraq veterans were at greater risk for receiving MH/PTSD diagnoses than were veterans ≥40 yrs (i.e., 18–24-year- olds more likely to receive 1 or more mental health diagnoses and PTSD diagnosis).	N/A	Generalizability : Sample restricted to only veterans who have left the Service and sought treatment at VA

NOTE: N/A—not available.

^a ICD-9-CM (*International Classification of Diseases, Ninth Revision, Clinical Modification*)—Diagnostic code of PTSD from medical records.

Table 3.9

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Erbes et al., 2007

Erbes, C., J. Westermeyer, B. Engdahl, and E. Johnsen. Post-traumatic stress disorder and service utilization in a sample of service members from Iraq and Afghanistan. *Military Medicine*, Vol. 172, No. 4, 2007, pp. 359–363.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 120

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Servicemembers returning from Iraq or Afghanistan who enrolled for care at the Minneapolis VA Medical Center (MVAMC), excluding those receiving mental health services at the VA between February 2005 and time of publication	Mailed survey	PTSD: PCL \geq 50 ^a Depression: BDI ^b Other: Alcohol use/ hazardous drinking, ^c quality of life, mental health service utilization	PTSD: 12%	Half of those screening positive for PTSD also screened positive for hazardous drinking		Generalizability: Sample restricted to only veterans who sought treatment at MVAMC Outcomes: Self- report Retention: 55% response rate; persons receiving treatment for mental health were excluded Small sample size: Power to detect only large differences

^a PCL \geq 50—Total score of at least 50 on the PTSD Checklist.

^b BDI—7 items from the Beck Depression Inventory (no further information provided).

^c Total score of at least 8 on a scale ranging from 0 to 40 across 10 items from the Alcohol Use Disorders Identification Test.

Table 3.10

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Kolkow et al., 2007

Kolkow, T. T., J. L. Spira, J. S. Morse, and T. A. Grieger. Post-traumatic stress disorder and depression in health care providers returning from deployment to Iraq and Afghanistan. *Military Medicine*, Vol. 172, No. 5, 2007, pp. 451–455.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 102

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
U.S. Military Health Care Providers previously deployed to Afghanistan or Iraq, assessed in 2004	Anonymous, Internet-based survey administered to military personnel "on staff" at Naval Medical Center San Diego	PTSD (past month): PCL-DSM-50 ^a Depression: PHQ- DSM ^b Other: Direct exposure, perceptions of threat during deployment, mental health service use, severity of physical problems	PTSD: 9% Depression: 5%	Non-White race was associated with PTSD and depression Frequent personal engagement in direct combat or being fired upon by opposition forces was associated with PTSD Threat perception (frequent concern regarding being in danger) had greater risk of PTSD	N/A	Generalizability: Sample restricted to health care providers or staff at Naval Medical Center San Diego Response rate: 36% among those recently deployed to combat areas, based on hospital personnel records; may exclude severely wounded/medically ill Outcomes: Self- report Small sample size: Power to detect only large differences

NOTE: N/A—not available.

^a PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

^b PHQ-DSM—Reporting 5 or more of 9 symptoms "more than half the day" or "nearly every day" in the specified period and the presence of depressed mood or anhedonia among those symptoms on the PHQ-9.

Table 3.11
Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Helmer et al., 2007

Helmer, D. A., M. Rossignol, M. Blatt, R. Agarwal, R. Teichman, and G. Lange. Health and exposure concerns of veterans deployed to Iraq and Afghanistan. *Journal of Occupational and Environmental Medicine*, Vol. 49, No. 5, 2007, pp. 475–480.
Type of Report (e.g., peer-reviewed, gov’t report): Peer-reviewed
N: 56
Design (e.g., cross-sectional, longitudinal, medical-record review): Medical-record review
Conditions Studied: PTSD

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, med record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Consecutively evaluated veterans at the New Jersey War-Related Injury and Illness Center (NJ-WRIIC) between June 2004 and January 2006	Chart review	PTSD: Definitive or probable diagnosis of PTSD in the final-impression section of the clinical notes	PTSD: 45%	N/A	No difference between Active Component and Reserve Component veterans	Generalizability: Sample restricted to only veterans who have sought treatment at NJ-WRIIC Small sample size: Power to detect only large differences

NOTE: N/A—not available.

Table 3.12

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Engelhard et al., 2007

Engelhard, I. M., M. A. Van Den Hout, J. Weerts, A. Arntz, J. J. C. M. Hox, and R. J. McNally. Deployment-related stress and trauma in Dutch soldiers returning from Iraq. *British Journal of Psychiatry*, Vol. 191, 2007, pp. 140–145.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 479

Design (e.g., cross-sectional, longitudinal, medical-record review): Longitudinal

Conditions Studied: PTSD

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Dutch Army troops from 3 successive 4-month rotations between March 2005 and March 2006 (an Armored Infantry Battalion and 2 battalions of the Air Assault Brigade)	Survey and Structured Clinical Interview for the DSM-IV (SCID) administered at Baseline (479 surveys) 5 months post-deployment (382 surveys/331 SCID) 15 months post-deployment (331 surveys/203 SCID)	PTSD: PSS ^a SCID ^b	PTSD (PSS/SCID) 5 months 12%/7%	Pre-deployment symptoms and harmful exposures in Iraq explained higher rates of PTSD among Armored Infantry Battalion	Higher prevalence of PTSD among Armored Infantry Battalion	Retention: 80%/71% (survey/SCID) response rate at 5 months; 69%/42% (survey/SCID) response rate at 15 months. Bias if nonrespondents/those lost to follow-up were significantly different from respondents.

^a PSS—Total score of 14 (range: 0–51) on the PTSD Symptom Scale.

^b SCID—Structured Clinical Interview for the DSM-IV (semi-structured diagnostic interview).

Table 3.13

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Martin, 2007

Martin, C. B. Routine screening and referrals for PTSD after returning from Operation Iraqi Freedom in 2005, U.S. Armed Forces. *MSMR: Medical Surveillance Monthly Report*, Vol. 14, No. 6, 2007, pp. 2–7.

Type of Report (e.g., peer-reviewed, gov't report): Publication of the Army Forces Health Surveillance Center

N: 91,408

Design (e.g., cross-sectional, longitudinal, medical-record review): Longitudinal

Conditions Studied: PTSD

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
U.S. armed forces returning from OIF in 2005	PDHA linked, when possible, to the PDHRA	PTSD: PC-PTSD ^a	PTSD: OIF: 10.5%	Those in medical service occupations were most likely to screen positive for PTSD Reservists and junior enlisted were more likely to screen positive for PTSD Military servicemembers in the Army were more likely to screen positive for PTSD Younger military members (<20 years) and older (>35 years) were the least likely to screen positive for PTSD	48.1% of those who received clinical diagnoses of PTSD within 6 months of returning from OIF deployment screened positive on the PDHA 29.9% of those who screened positive on the PDHRA screened positive on the PDHA	Quality control: Not peer-reviewed Generalizability: Unknown Outcomes: Self- report, and screening tools with low specificity Retention: 24% of returning servicemembers did not have a PDHA; the proportion of those with a PDHA who had a PDHRA is not disclosed. Differences between those who complete follow-up and those who do not are not addressed.

NOTES: PDHA—Post-Deployment Health Assessment (survey for all military personnel conducted immediately upon returning from any deployment); PDHRA—Post-Deployment Health Reassessment (survey for all military personnel conducted 3–6 months after returning from any deployment).

^a PC-PTSD—Reporting 2 or more of 4 items on Primary Care–PTSD (PC-PTSD) Screen.

Table 3.14
Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Milliken, Auchterlonie, and Hoge, 2007

Milliken, C. S., J. L. Auchterlonie, C. W. Hoge. Longitudinal assessment of mental health problems among Active and Reserve Component soldiers returning from the Iraq war. *Journal of the American Medical Association*, Vol. 298, No. 18, 2007, pp. 2141–2148.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 88,235

Design (e.g., cross-sectional, longitudinal, medical-record review): Longitudinal

Conditions Studied: PTSD, Depression

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Army soldiers returning from OIF between June 1, 2005, and December 31, 2006	PDHRA linked to PDHA and administrative records on use of medical services	PTSD: PC-PTSD ^a Depression: PHQ-2 ^b Other: Other mental health problem, referral for an MH reason, suicidal ideation, alcohol-use disorder	PTSD PDHA Active: 11.8% Reserve: 12.7% PDHRA Active: 16.7% Reserve: 24.5% Depression PDHA Active: 4.7% Reserve: 3.8% PDHRA Active: 10.3% Reserve: 13.0%	N/A	Higher rates among National Guard and Reserve More than 2 times as many new PTSD cases on PDHRA (at 6 months) as on PDHA (at 1 month)	Generalizability: Excludes those who did not complete the PDHRA Outcomes: Self-report, and screening tools with low specificity Retention: Proportion of individuals with initial assessment who completed follow-up is not disclosed. Differences between those who complete follow-up and those who do not are not addressed.

NOTES: N/A—not available; PDHA—Post-Deployment Health Assessment (survey for all military personnel conducted immediately upon returning from any deployment); PDHRA—Post-Deployment Health Reassessment (survey for all military personnel conducted 3–6 months after returning from any deployment).

^a PC-PTSD—Reporting 2 or more of 4 items on Primary Care–PTSD (PC-PTSD) Screen.

^b PHQ-2—Positive response to question on depressed mood or anhedonia.

Table 3.15

**Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq:
Rosenheck and Fontana, 2007**

Rosenheck, R. A., and A. F. Fontana. Recent trends in VA treatment of post-traumatic stress disorder and other mental health disorders. *Health Affairs*, Vol. 26, No. 6, 2007, pp. 1720–1727.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: >1 million

Design (e.g., prospective, cross-sectional, retrospective): Retrospective

Conditions Studied: PTSD, other mental health condition

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Veterans receiving VA care in 1997, 1999, 2001, 2003, and 2005; OEF/OIF veterans were identified as being born after 1972 and having their first VA outpatient encounter after 1991	Medical-record review of users of the VA health care system	PTSD: ICD-9 ^a PTSD diagnosis code Other mental diagnosis: ICD-9 code	Average annualized percentage increase in PTSD diagnoses among approximated OEF/OIF sample: 1997–2001: 31.2 2001–2003: 31.6 2003–2005: 232.1	N/A	Most of the increase in PTSD treatment between 1997 and 2005 in the VA represents increased use of services by veterans from earlier eras.	Generalizability: Sample restricted to only veterans who have sought treatment at VA Misclassification: Approximated sample of OEF/OIF veterans that is likely to exclude older veterans

NOTE: N/A—not available.

^a ICD-9-CM (*International Classification of Diseases, Ninth Revision, Clinical Modification*)—Diagnostic code of PTSD from medical records.

Table 3.16

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Lapierre, Schwegler, and LaBauve, 2007

Lapierre, C. B., A. F. Schwegler, and B. J. LaBauve. Posttraumatic stress and depression symptoms in soldiers returning from combat operations in Iraq and Afghanistan. *Journal of Traumatic Stress*, Vol. 20, No. 6, 2007, pp. 933–943.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 4,089

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Army soldiers returning from Afghanistan and Iraq between February and July 2005	Survey administered to soldiers returning from Afghanistan ($n=1,810$) and Iraq ($n=2,266$) at an Army-sponsored reintegration training program	PTSD: SPTSS ^a Depression: Center for Epidemiologic Studies Depression Inventory, 20-item version (CES-D-20) ^b	PTSD: Afghanistan: 30% Iraq: 31% Depression: Afghanistan: 38% Iraq: 37%	Junior enlisted reported higher levels of post-traumatic distress and depression Separated and divorced reported higher levels of post-traumatic distress and depression and divorced reported higher levels of depression	Those deployed to OIF had higher PTSD scores than those deployed to OEF; depression scores were no different	Outcomes: Self-report, and not well-validated screening tool for PTSD (low specificity) Generalizability: Unknown

^a SPTSS—An average total score of 4 or more (range: 0–10) on the Screen for Posttraumatic Stress Symptoms.

^b CES-D-20—Averaged score across 20 depressive symptoms >16 (range: 0–20) on Center for Epidemiologic Studies Depression Inventory, 20-item version.

Table 3.17
Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Smith et al., 2008

Smith, T. C., M. A. K. Ryan, D. L. Wingard, D. J. Slymen, J. F. Sallis, and D. Kritz-Silverstein, and Team for the Millennium Cohort Study. New onset and persistent symptoms of post-traumatic stress disorder self reported after deployment and combat exposures: Prospective population based US military cohort study. *British Medical Journal*, published online, January 15, 2008.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed
N: 50,184

Design (e.g., cross-sectional, longitudinal, medical-record review): Longitudinal

Conditions Studied: PTSD

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
U.S. armed forces deployed 1 or more days to Afghanistan and Iraq between July 2001 and June 2003 and between June 2004 and February 2006	Survey administered twice to cohort that included servicemembers who deployed (n=11,952) and those who did not deploy (n=38,176)	PTSD: PCL-DSM ^a PCL-DSM-50 ^b or self-report of a doctor telling the respondent s/he had PTSD	PTSD (DSM/DSM-50): Among those without PTSD at baseline: Deployed with combat exposure: 8.7/7.3 Deployed without combat exposure: 2.1/1.4 Nondeployed: 3.0/2.3 Among those with PTSD at baseline: Deployed with combat exposure: 47.9/43.5 Deployed without combat exposure: 22.4/26.2 Nondeployed: 45.9/47.6	Across Service branches, deployment was strongly associated with onset PTSD status. After adjusting for deployment status, the following were linked with PTSD, by Service branch: Army: female, never married (less likely), enlisted Air Force: female, divorced, enlisted Navy/Coast Guard: female, divorced, Black non-Hispanic, enlisted Marine Corps: divorced	Members of the Air Force were less likely to develop onset PTSD than other Service branches	Generalizability: Overrepresented those least likely to experience combat (females, Air Force, and officers), with no adjustment to make results representative to deployed force. Excludes those deployed before baseline assessment, or who completed baseline or follow-up assessments while deployed Outcomes: Self-report Attrition/Retention: 36% response rate at baseline; 71% response rate at follow-up

^a PCL-DSM—Reporting at least 1 intrusion symptom, 3 avoidance symptoms, and 2 hyperarousal symptoms at the moderate level on the PTSD Checklist.

^b PCL-DSM-50—PCL-DSM = total score of at least 50 (range: 17–85) on the PTSD Checklist.

Table 3.18

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Hoge et al., 2008

Hoge, C. W., D. McGurk, J. L. Thomas, A. L. Cox, C. C. Engel, C. A. Castro. Mild traumatic brain injury in U.S. soldiers returning from Iraq. *New England Journal of Medicine*, Vol. 358, No. 5, 2008, pp. 453–463.

Type of Report (e.g., peer-reviewed, gov't report): Peer-reviewed

N: 2,714

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: mTBI

Sample which Service (e.g., Army, Navy)	Assessment (e.g., survey, medical record)	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
U.S. Army soldiers from two combat infantry brigades (one Active Component, one Reserve Component) 3–4 months after returning from OIF in 2006	Anonymous survey	TBI: Reporting having an injury that involved an injury to the head and at least one of the following: Losing consciousness (knocked out) Being dazed, confused, or seeing stars Not remembering the injury	mTBI: 15.2%	Relative to soldiers with injuries who did not experience mTBI symptoms, those with TBI symptoms were more likely to have reported high combat intensity, a blast mechanism of injury, more than one exposure to an explosion, and hospitalization during deployment. Also, those with TBI were younger , more likely to be junior in rank , and male .	Percentage of those meeting criteria for PTSD/Major Depression: Loss of consciousness: 43.9/22.9 Altered mental status: 27.3/8.4 Injury, no mTBI: 16.2/6.6 No injury: 9.1/3.3	Generalizability: Sample excludes severely wounded or those who may have been removed from units; not randomly selected Outcomes: Self-report

NOTE: mTBI—mild traumatic brain injury.

Table 3.19

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: U.S. Department of the Army, Office of the Surgeon General (MHAT-I), 2003

U.S. Department of the Army, Office of the Surgeon General, Mental Health Advisory Team (MHAT). *Operation Iraqi Freedom (OIF), MHAT Report*. U.S. Army Surgeon General and HDQA G-1, December 16, 2003.

Type of Report (e.g., peer-reviewed, gov't report): Gov't report

N: 756

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample <i>which Service (e.g., Army, Navy.)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Army soldiers in Iraq and Kuwait between August and October 2003	Anonymous surveys administered in base camps in Iraq (combat line companies from brigade combat teams, <i>n</i> =577) and Kuwait (areas thought to have high operational stress, <i>n</i> =179)	<p>Acute stress (PTSD): Endorse "several items" as moderate on PCL^a scale and mark that the problem caused functional impairment (if symptoms affect work)</p> <p>Depression: Endorse several items on PHQ^a as occurring "more than half the days" and functional impairment (how difficult symptoms make it to do work or get along with people) at "very difficult" or "extremely difficult" level</p>	<p>Acute stress: 15%</p> <p>Depression: 7%</p> <p>Depression, anxiety, or acute stress: 19%</p>	<p>Lower personal and unit morale and lower cohesion were associated with reports of mental health symptoms</p>	Relative to samples of pre-deployed troops preparing to deploy or just returning from Afghanistan, troops in Iraq had higher rates of mental health conditions, driven primarily by acute stress	<p>Quality control: Not peer-reviewed</p> <p>Generalizability: Unknown</p>

^a No further information given on the scoring method used.

Table 3.20

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: U.S. Department of the Army, Office of the Surgeon General (MHAT-II), 2005

U.S. Department of the Army, Office of the Surgeon General, Mental Health Advisory Team (MHAT-II). *Operation Iraqi Freedom (OIF-II), MHAT-II Report*. U.S. Army Surgeon general, January 30, 2005.

Type of Report (e.g., peer-reviewed, gov't report): Gov't report

N: 2,064

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Army soldiers in Iraq and Kuwait between August and October 2004	Anonymous survey administered in Iraq (line units from brigade combat teams, $n=1,595$) and Kuwait (battalion-level units more likely to experience combat or operational stress, $n=469$)	Acute stress (PTSD): PCL-DSM-50 ^a Depression: PHQ-DSM-FI ^b	Acute stress: 10% Depression: 5% Depression, anxiety, or acute stress: 13%	Subjects in Kuwait had slightly lower levels of mental health problems than those in Iraq Transportation and support personnel had higher levels of screening positive for each mental health problem than soldiers in combat or other units	Lower levels of acute stress than in MHAT-I; no statistically significant difference for depression from MHAT-I	Quality control: Not peer-reviewed Generalizability: Unknown

^a PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

^b PHQ-DSM-FI—PHQ-DSM on the PHQ-9 + self-reported functional impairment.

Table 3.21

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command (MHAT-III), 2006a

U.S. Department of the Army, Office of the Surgeon Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command, Mental Health Advisory Team (MHAT-III). *Operation Iraqi Freedom 04-06, MHAT-III Report*. May 29, 2006a.

Type of Report (e.g., peer-reviewed, gov't report): Gov't report

N: 1,124

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Army soldiers in Iraq in October and November 2005	Anonymous survey delivered to sample of soldiers from 9 brigade combat teams located at 13 Forward Operating Bases and associated units throughout Iraq	Acute stress (PTSD): PCL-DSM-50 ^a Depression: PHQ-DSM+FI ^b	Acute stress symptoms: 14% Depression: 8% Depression, anxiety, or acute stress: 17%	Multiple deployment (e.g., 1 or more prior deployments to Iraq) were associated with higher levels of acute stress (18.4%) relative to those on their first deployment (12.5%)	Relative to the MHAT-II Iraq-only samples, MHAT-III sample had significantly higher levels of depression and any psychological problem; no difference relative to MHAT-I Iraq-only sample	Quality control: Not peer-reviewed Generalizability: Unknown

^a PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

^b PHQ-DSM+FI—PHQ-DSM on the PHQ-9 + self-reported functional impairment.

Table 3.22

Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command, 2006b

U.S. Department of the Army, Office of the Surgeon, Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command, Mental Health Advisory Team (MHAT-IV). *Operation Iraqi Freedom 05-07, MHAT-IV Report*. November 17, 2006b.

Type of Report (e.g., peer-reviewed, gov't report): Gov't report

N: 1,767

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional

Conditions Studied: PTSD, Depression

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Army soldiers and Marines in Iraq (May 2007)	Anonymous survey delivered to sample of soldiers and marine line companies, primarily from brigade combat teams (Army, <i>n</i> =1,320) and regimental combat teams (marines, <i>n</i> =447). Also included soldiers and marines in support units, and the corps and division levels from all Iraq regions where significant U.S. ground forces existed in May 2007	Acute stress (PTSD): PCL-DSM-50 ^a Depression: PHQ-DSM+FI ^b	Depression (% Marines/ % Soldiers) 4/9% Acute stress (% Marines/% Soldiers) 14/17% Depression, anxiety, or acute stress (% Marines/ % Soldiers) 15/20%	Level of combat (low, medium, high) related to positive screen for anxiety, depression, or acute stress Multiple deployment (e.g., 1 or more prior deployments to Iraq) was associated with higher levels of acute stress, depression, anxiety, or any mental health problem Deployment for more than 6 months was positively associated with acute stress, depression, anxiety, and any mental health problem relative to deployment for less than 6 months	No differences among soldiers relative to MHAT-I and MHAT-III; Marines screening positive for depression had lower levels than Army soldiers in MHAT-I, MHAT-III, MHAT-IV.	Quality control: Not peer-reviewed Generalizability: Unknown

^a PCL-DSM-50—PCL-DSM + total score of at least 50 (range: 17–85) on the PTSD Checklist.

^b PHQ-DSM+FI—PHQ-DSM on the PHQ-9 + self-reported functional impairment.

Table 3.23
Studies of Mental and Cognitive Conditions Among Servicemembers Returning from Afghanistan and Iraq: Abt Associates Inc., 2006

Abt Associates Inc. 2003–2004 *Active Duty Health Study: Final Report*. Falls Church, Va.: TRICARE Management Activity, Health Program Analysis and Evaluation Directorate, December 30, 2006.

Type of Report (e.g., peer-reviewed, gov't report): Gov't-sponsored report
N: 2,761

Design (e.g., cross-sectional, longitudinal, medical-record review): Cross-sectional
Conditions Studied: PTSD

Sample <i>which Service (e.g., Army, Navy)</i>	Assessment <i>(e.g., survey, medical record)</i>	Outcome Measures	Results	Correlates of Mental Health Conditions	Comparisons	Critique
Stratified, random sample of servicemembers from the Active Component who deployed to Iraq or Afghanistan on or after January 2003 and returned from theater by February 2004	Survey of deployed (<i>n</i> =1,419) and nondeployed (<i>n</i> =1,342) servicemembers from the Active Component	PTSD: PCL-DSM ^a Other: Quality of life, cognitive functioning, deployment, social support	PTSD: Deployed: 7.3% Nondeployed: 4.1%	Unit cohesion scores were negatively associated with PTSD scores Mean scores of all quality-of-life domains and cognitive functioning for deployed servicemembers with PTSD were much lower than for those deployed without PTSD	Deployed servicemembers were more likely to screen positive for PTSD than nondeployed servicemembers	Generalizability: Active Component only; no Reserve Component represented Response rate: 46%; may be less likely to capture those who are more severely impaired

^a PCL-DSM—Reporting at least 1 intrusion symptom, 3 avoidance symptoms, and 2 hyperarousal symptoms at the moderate level on the PTSD Checklist.

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