

Invisible Wounds of War

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

TERRI TANELIAN AND LISA H. JAYCOX, EDITORS

Sponsored by the California Community Foundation



Center for Military Health Policy Research

A JOINT ENDEAVOR OF RAND HEALTH AND THE
RAND NATIONAL SECURITY RESEARCH DIVISION

This work was funded by a grant from the Iraq Afghanistan Deployment Impact Fund, which is administered by the California Community Foundation. The study was conducted jointly under the auspices of the Center for Military Health Policy Research, a RAND Health center, and the Forces and Resources Policy Center of the National Security Research Division (NSRD).

Library of Congress Cataloging-in-Publication Data

Tanielian, Terri L.

Invisible wounds of war : psychological and cognitive injuries, their consequences, and services to assist recovery / Terri Tanielian, Lisa H. Jaycox.

p. ; cm.

Includes bibliographical references.

ISBN 978-0-8330-4454-9 (pbk. : alk. paper)

1. Post-traumatic stress disorder—United States. 2. Brain—Wounds and injuries—United States. 3. Depression—United States. 4. Veterans—Mental health—United States. 5. Iraq war, 2003—Psychological aspects. 6. Afghan war, 2001—Psychological aspects. 7. War on terrorism, 2001—Psychological aspects. 8. War—Psychological aspects. I. Jaycox, Lisa. II. Rand Corporation. III. Title.

[DNLM: 1. Combat Disorders. 2. Brain Injuries. 3. Depressive Disorder.

4. Iraq War, 2003— . 5. Stress Disorders, Post-Traumatic. 6. Veterans—psychology. WM 184 T164i 2008]

RC552.P67T34 2008

362.196'85212—dc22

2008008840

The RAND Corporation is a nonprofit research organization providing objective analysis and effective solutions that address the challenges facing the public and private sectors around the world. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors.

RAND® is a registered trademark.

*Cover design by Eileen Delson La Russo
Cover photo: U.S. Army photo by SPC Eric Jungels*

© Copyright 2008 RAND Corporation

All rights reserved. No part of this book may be reproduced in any form by any electronic or mechanical means (including photocopying, recording, or information storage and retrieval) without permission in writing from RAND.

Published 2008 by the RAND Corporation

1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138

1200 South Hayes Street, Arlington, VA 22202-5050

4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665

RAND URL: <http://www.rand.org>

To order RAND documents or to obtain additional information, contact

Distribution Services: Telephone: (310) 451-7002;

Fax: (310) 451-6915; Email: order@rand.org

Introduction

Terri Tanielian, Lisa H. Jaycox, David M. Adamson, and Karen N. Metscher

Signature Wounds

Since October 2001, approximately 1.64 million U.S. troops have deployed as part of Operation Enduring Freedom (OEF, Afghanistan) and Operation Iraqi Freedom (OIF, Iraq). These operations have employed smaller forces and (notwithstanding episodes of intense combat) have produced casualty rates of killed or wounded that are historically lower than in earlier prolonged conflicts, such as Vietnam and Korea. However, casualties of a different kind—invisible wounds, such as mental health conditions and cognitive impairments resulting from deployment experiences—are just beginning to emerge. Recent reports and increasing media attention have prompted intense scrutiny and examination of these injuries. As a grateful nation seeks to find ways to help those with injuries recover, research and analysis of the scope of the problem are ongoing, and there is limited evidence to suggest how best to meet the needs of this population.

The majority of servicemembers deployed to Afghanistan and Iraq return home without problems and are able to readjust successfully; however, early studies of those returning from Afghanistan and Iraq suggest that many may be suffering from mental disorders. Upward of 26 percent of returning troops may have mental health conditions (applying broad screening criteria for post-traumatic stress disorder, anxiety disorder, or depression), and the frequency of diagnoses in this category is increasing while rates for other medical diagnoses remain constant (Hoge et al., 2004). The most common diagnoses are post-traumatic stress disorder (PTSD), an anxiety disorder that can develop after direct or indirect exposure to a terrifying event or ordeal in which grave physical harm occurred or was threatened; major depression; and generalized anxiety (National Institute of Mental Health Web site, Mental Health Topics page).

Recent data available from the Department of Defense (Hoge et al., 2004; Milliken, Auchterlonie, and Hoge, 2007; Smith et al., 2008) provide both pre-deployment and post-deployment data for these conditions. For example, Hoge et al. (2004) examined Army and Marine Corps personnel both before and after deployment, as well as their peers who were not deployed. Results showed that 16 to 17 percent of those returning from Iraq met strict screening criteria for mental health conditions. About 11 percent of servicemembers returning from Afghanistan reported symptoms consistent with a

mental health condition, compared with about 9 percent of those not deployed, suggesting that the nature of the exposures in Iraq may be more traumatic (Hoge et al., 2004).

In today's battlefields, the use of improvised explosive devices (IEDs) has made traumatic brain injury (TBI) a major concern for servicemembers. According to the Defense Veterans Brain Injury Center, approximately 2,700 U.S. troops have suffered a traumatic brain injury, and potentially hundreds of thousands more (at least 30 percent of troops engaged in active combat in Afghanistan and Iraq for four months or more) may have suffered a mild TBI as a result of IED blast waves (Glasser, 2007; Hoge et al., 2007; Hoge et al., 2008). There is some indication that TBI and PTSD have overlapping symptoms. For example, Hoge et al. (2008) suggest that, once PTSD symptoms are taken into account, linkages between a mild TBI and current symptoms or physical health outcomes are no longer significant, except for headache, indicating that some of the experience of such problems may be attributable to PTSD rather than to the injury itself. These high rates of mental health conditions and TBI among post-deployment servicemembers and veterans have led some to refer to PTSD and traumatic brain injury as the "signature wounds" of Operation Enduring Freedom and Operation Iraqi Freedom (Altmire, 2007).

The psychological wounds of war are nothing new. The risk for mental health conditions and the need for mental health services among military servicemembers are greater during wars and conflicts (Milliken, Auchterlonie, and Hoge, 2007; Rosenheck and Fontana, 1999; and Marlowe, 2001). Combat stress (historically termed soldier's heart, shell shock, or battle fatigue) is a known and accepted consequence of warfare. Although diagnoses such as PTSD were not formally defined and adopted until the 1970s, the existence of psychiatric casualties in war undoubtedly goes back as far as warfare itself (Rosenheck and Fontana, 1999; Marlowe, 2001).

The U.S. military has tracked and planned for mental health casualties at least since World War II. Among the 16.1 million U.S. troops who served in that war, medical estimates indicate that the incidence of psychiatric-related casualties ranged between 28 per 1,000 and 101 per 1,000, depending on assignment (Dean, 1997). In the Korean War (1950–1953), 5.7 million U.S. troops deployed and the incidence was reported to be at the 37 per 1,000 mark (Dean, 1997; Jones and Palmer, 2000). In Vietnam (1960–1975), 3.4 million served in theater, with a reported incidence rate of 12 per 1,000 (Dean, 1997; Jones and Palmer, 2000). Many scholars believe that these figures may be understated due to the lack of uniform evaluation and diagnosis, inaccurate recording during these earlier times, and the documentation of only rates on the battlefield (that is, these estimates do not include conditions that may have developed post-combat) (Dean, 1997; Jones and Palmer, 2000; U.S. Census Bureau, 1999). Over the years, the Department of Defense has made efforts to improve evaluation, diagnosis, and recording of psychiatric casualties. However, the changing definitions and measures of combat-related mental health conditions make it difficult to compare incidence rates across different conflicts.

During the Vietnam War, the medical system created a more formal infrastructure in which to diagnose and treat what would later be termed post-traumatic stress disorder and related mental health problems. With the more in-depth monitoring and study during this conflict, analysis found that incidence varied significantly according to characteristics of combat exposure. High-intensity combat produced a higher incidence of psychiatric casualties, and the infantry was disproportionately affected (Dean, 1997; Jones and Palmer, 2000; Newman, 1964).

In the midst of the Vietnam War, there was also concern about readjustment difficulties that veterans were facing on returning home. For the first time, the nation expressed a collective concern about the mental health of returning veterans. In 1970, Congress conducted the first hearing to address these issues (Rosenheck and Fontana, 1999). Following return from the combat zone, servicemembers reported psychological problems, including anxiety, depression, nightmares, and insomnia. The Vietnam era was a turning point in the assessment and treatment of combat-related psychological distress. PTSD was officially defined as a mental disorder in 1979, in recognition of the potentially disabling mental health challenges confronting veterans returning from the war: “The most lasting contribution of Vietnam to the history of battle trauma is the legacy of post-traumatic stress disorder (PTSD)” (Helmus and Glenn, 2005). The National Vietnam Veterans Readjustment Study (NVVRS) estimated that, in 1998, 15 percent (472,000) of those who had served in Vietnam met the criteria for active PTSD (Rosenheck and Fontana, 1999).

Unique Features of the Current Deployments

While stress has been a fact of combat since the beginning of warfare, three novel features of the current conflicts may be influencing rates of mental health and cognitive injuries at present: changes in military operations, including extended deployments; higher rates of survivability from wounds; and traumatic brain injuries.

Changes in Military Operations, Including Extended Deployments

The campaigns in Afghanistan and Iraq represent the most sustained U.S. combat operations since the Vietnam War. The number of military deployments has increased exponentially in recent years (Belasco, 2007; Bruner, 2006; Serafino, 2003). Troops are seeing more-frequent deployments, of greater lengths, with shorter rest periods in between—factors thought to create a more stressful environment for servicemembers. The day-to-day activities of troops in combat vary widely, but some common stressors in the current conflicts have been identified as roadside bombs, IEDs, suicide bombers, the handling of human remains, killing an enemy, seeing fellow soldiers and friends dead or injured, and the helplessness of not being able to stop violent situations (Hoge

et al., 2004). Because of the nature of these current conflicts, a high proportion of deployed soldiers are likely to experience one or more stressors.

At the same time, doctrinal changes have influenced the way in which the United States employs, deploys, and supports its armed forces, as well as how the military approaches combat operations and operations other than war (see Chapter Two). Even though many recent military operations have been characterized as peacekeeping missions or stability operations, many of these efforts may share the same risks and stressors inherent in combat—exposure to hostile forces, injured civilians, mass graves, and land mines, for example.

Higher Rates of Survivability from Wounds

The current conflicts have witnessed the highest ratio of wounded to killed in action in U.S. history. As of early January 2008, the Department of Defense (DoD) reports a total of 3,453 hostile deaths and over 30,721 wounded in action in Afghanistan and Iraq (see DoD Personnel & Procurement Statistics, Military Casualty Information page). Although a high percentage of those wounded is returned to duty within 72 hours, a significant number of military personnel are medically evacuated from theater (including approximately 30,000 servicemembers with nonhostile injuries or other medical issues/diseases). Approximately 3,000 servicemembers returned home from Iraq or Afghanistan with severe wounds, illnesses, and/or disabilities, including amputations, serious burns, spinal-cord injuries, blindness, and traumatic brain injuries (President's Commission on Care for America's Returning Wounded Warriors, 2007). The ratio of wounded to killed is higher than in previous conflicts as a result of advances in combat medicine and body armor. Wounded soldiers who would have likely died in previous conflicts are instead saved, but with significant physical, emotional, and cognitive injuries. Thus, caring for these wounded often requires an intensive mental-health component in addition to traditional rehabilitation services.

Traumatic Brain Injuries

Also gaining attention recently are cognitive injuries in returning troops. In particular, traumatic brain injury in combat veterans is getting increasing consideration in the wake of the current military conflicts. TBI is associated with decreased levels of consciousness, amnesia, and other neurological abnormalities; skull fracture; and intracranial lesions; and it can lead to death (Thurman et al., 1995). Blasts are the primary cause of TBI for active duty military personnel in war zones (Defense and Veterans Brain Injury Center, 2005). TBI diagnoses can range from mild to severe. In its milder forms, TBI can resolve quickly (often within three months of the injury), and it can be difficult to diagnose and distinguish from psychological co-morbidities.

The term *traumatic brain injury* appears in the medical literature at least as far back as the 1950s, but its early use is almost exclusively in reference to relatively severe

cases of brain trauma.¹ Its application to mild concussive injuries, which are now a major focus of military medicine, begins to appear in the medical literature in the 1990s, with a significant increase in usage since the onset of the current conflicts. However, the exact nature of any emotional or cognitive deficits or demonstrable neuropathology resulting from exposure to a blast has not been firmly established (Hoge et al., 2008), leaving open many questions about the extent of problems that might be expected from servicemembers who have been exposed.

Caring for Invisible Wounds

Rates of PTSD and concerns about mild TBI among those returning from Afghanistan and Iraq have sparked media attention and additional health assessments of servicemembers three to six months after they redeploy. However, the extent to which mental health and cognitive problems are being detected and appropriately treated in this population remains unclear. Unlike the physical wounds of war that maim or disfigure, PTSD, major depression, and TBI are often invisible to other servicemembers, family members, the military, and the broader society.

For instance, although the military does screen for post-deployment health issues, health officials have speculated that soldiers leaving the war zone often minimize or fail to disclose mental health symptoms for fear that admitting any problem could delay their return home. And even if risk of a mental health problem is detected among those returning home, whether effective treatment is delivered is uncertain. The Government Accountability Office (GAO) (2006) noted concern about adequate follow-up and treatment, citing low rates of referrals for mental health treatment among those screening positive for post-traumatic stress.

In addition, only a small proportion of those returning from deployment who experience symptoms seeks mental health care, according to early studies (GAO, 2006; Hoge, Auchterlonie, and Milliken, 2006; Milliken, Auchterlonie, and Hoge, 2007). For example, Hoge et al. (2004) found that only 23–40 percent of those who met their strict criteria for a mental health problem reported receiving professional help in the past year. Changes in utilization rates of mental health services as a result of current combat operations are also documented. From 2000 to 2004, the number of active duty marines and soldiers accessing mental health care increased from 145.3 to 222.3 per 1,000 (Hoge, Auchterlonie, and Milliken, 2006). All categories of recent combat veterans show increasing utilization rates, but veterans returning from Iraq are accessing care at a much higher rate than those returning from Afghanistan or those in any other category (Hoge, Auchterlonie, and Milliken, 2006). However, there are still “no

¹ Query conducted through PubMed database, National Center for Biotechnology Information, August 2007.

systematic studies of mental health care utilization among these veterans after deployment” (Hoge, Auchterlonie, and Milliken, 2006). In addition, although utilization rates for mental health services are increasing, those who are accessing care and those who are identified as needing care are not necessarily the same people.

The federal system of medical care for this population spans the Departments of Defense and Veterans Affairs. OEF/OIF veterans are eligible to receive care through the Department of Defense (while they are on active duty or covered by TRICARE) and the Veterans Health Administration (all OEF/OIF veterans are eligible for five years following military discharge). The Department of Defense does not have a unified mental health program, but a fairly comprehensive array of mental health services is available through the Services, military hospitals, and the TRICARE network, and programs typically are designed and implemented at the local level (Defense Health Board Task Force on Mental Health, 2007). As a result, the mental health services provided across the system vary considerably (Defense Health Board Task Force on Mental Health, 2007). The DoD mental health providers also collaborate with non-medical support systems, which include Family Support Centers, chaplains, civilian support organizations, and the Department of Veterans Affairs (VA).

Since 1930, the VA has provided primary care, specialized care, and related medical and social support services for veterans of the U.S. military (Department of Veterans Affairs, 2007). The VA operates the largest integrated health care system in the United States. Veterans are eligible to receive care from the VA through a priority system, which is based on the severity of military service-connected disability and financial need. Mental health services are primarily delivered through ambulatory settings—outpatient and community-based clinics, with several specialized programs for PTSD.

The VA has been a leader in promoting quality care in the United States. The VA’s National Center for PTSD has been a recognized national leader in conducting research and promoting appropriate treatment for veterans suffering from PTSD. The VA’s poly-trauma system of care has rapidly evolved to expand services for TBI among returning veterans as well. However, not all veterans receive their care through the VA.

Over the past year, both DoD and the VA have come under congressional and public scrutiny regarding their capacity to address PTSD and TBI. Congress has directed billions of dollars to address perceived capacity constraints, whether on human resources or financial resources; however, little is known to date about the capacity requirements for addressing the needs of the newest veteran population.

Direct medical costs of treatment are only a fraction of the total costs related to psychological and cognitive injuries. Indirect, long-term individual and societal costs stem from lost productivity, reduced quality of life, homelessness, domestic violence, the strain on families, and suicide. Delivering effective mental health care and restoring veterans to full mental health has the potential to reduce these longer-term costs significantly. Therefore, it is important to consider the direct costs of care in the context

of the potentially higher indirect, long-term costs of providing no care or inadequate care. Unfortunately, data on these longer-term costs among the military population are sparse at best and largely unavailable. For this reason, most of the national discussion of resources has focused on direct medical costs to the government.

Increasing numbers of veterans are also seeking care in the private, community sector, outside the formal military and veterans health systems. Yet, we have very little systematic information about the organization and delivery of services for veterans in the non-federal sector, particularly with respect to access and quality.

Ongoing advances in treatment provide hope for a new generation of servicemembers suffering the psychological effects of warfare. Medical science provides a better understanding than ever before of how to treat the psychological effects of combat. With *evidence-based interventions*, treatments that have been proven to work, “complete remission can be achieved in 30–50 percent of cases of PTSD, and partial improvement can be expected with most patients” (Friedman, 2006, p. 592). Studies continue to raise a “hopeful possibility that PTSD may be reversible if patients can be helped to cope with stresses in their current life” (Friedman, 2004, p. 76). Similarly, effective treatments for major depression are available and may be appropriate for this population (APA, 2000). However, treatment for traumatic brain injury among combat veterans is still in the early stages of development and evaluation; experts indicate that, with appropriate rehabilitation and treatment, those suffering from TBI can regain functioning.

The Current Policy Context

Public concern over these issues is running high, as reflected in the activity of policy leaders at all levels of government and throughout many government agencies. The Department of Defense, the Department of Veterans Affairs, Congress, and the President have moved to study the issues, quantify the problems, and formulate policy solutions, producing rapid recommendations for changes and expansion of services designed to detect and treat these problems. For instance, immediately following coverage of conditions at Walter Reed, Defense Secretary Robert Gates formed an Independent Review Group to Conduct an Assessment of Outpatient Treatment at Walter Reed Army Medical Center (WRAMC) and the National Naval Medical Center (NNMC). Tasked with identifying critical shortcomings, suggesting opportunities to improve care and quality of life for injured and sick servicemembers, and making recommendations for corrective actions, the group cited concerns about coordination across the continuum of care for injured servicemembers and recommended the establishment of a center of excellence for TBI and PTSD treatment, research, and training (Independent Review Group to Conduct an Assessment of Outpatient Treatment

at Walter Reed Army Medical Center [WRAMC] and the National Naval Medical Center [NNMC], 2007).

Also in the wake of the Walter Reed press coverage, President Bush established the President's Commission on Care for America's Returning Wounded Warriors to review all health care for wounded servicemembers. Their July 2007 report called for radical changes in the coordination of care for severely injured servicemembers and the disability evaluation and compensation system, but also highlighted the special challenges associated with PTSD and TBI. The report also included a recommendation to enable all OEF/OIF veterans who need care for PTSD to receive it from the VA. This recommendation remains under policy consideration at the time of this writing.

In conjunction with the President's Commission to look at the military system, President Bush also directed Department of Veterans Affairs Secretary Jim Nicholson to establish an Interagency Task Force on Returning Global War on Terror Heroes. In this task force, solutions were identified within existing funding levels and included a governmentwide action plan. Specific changes for DoD and the VA in response to these groups included the joint assignment of disability ratings and co-management for continuity of care.

The work on these issues was also informed by a congressionally mandated DoD Task Force on Mental Health, which operated as a subcommittee of the Defense Health Board to examine matters relating to mental health and the armed forces. Its report, released in May 2007, called for major changes in the culture for psychological health within the military, the provision of additional resources to meet requirements, and enhancements to the provision of the full continuum of excellent care.

The President, Congress, DoD, and the VA have acted swiftly to pursue implementation of the hundreds of recommendations emerging from the task force and commission reports. As a result, policy changes and funding shifts are already occurring for military and veterans' health care in general and mental health services in particular. Several new programs and expansions of treatment and support services have already been established or are under development. Both DoD and the VA have taken steps to increase the number of mental health providers; instituted broad-based screening for mental health and cognitive conditions among OEF/OIF veterans within their primary care settings; expanded training in the provision of care and screenings for servicemembers, military leaders, and providers; and created new resources for servicemembers and veterans, in the form of hotlines and online resources. Most recently, the Office of the Secretary of Defense for Health Affairs announced the establishment of the Defense Center of Excellence for Psychological Health [PH] and Traumatic Brain Injury (DCoE). In collaboration with the VA, the DCoE plans to lead a national collaborative network to advance and disseminate knowledge about psychological health and TBI, enhance clinical and management approaches, and facilitate other vital services to best serve the urgent and enduring needs of servicemembers and veterans families.

Through these ongoing efforts, the VA, DoD, and the armed services have attempted to improve the care and support provided to veterans, servicemembers, and their families facing mental, emotional, and cognitive challenges as a result of their deployments to Afghanistan and Iraq. To build an evidence base for future quality improvement, a rigorous evaluation of the effect of current and future programs is an essential element of the policy and programming.

Given the effort and energy that has been channeled and is being channeled into improving care for veterans and servicemembers who have suffered mental health or cognitive injuries in Afghanistan and Iraq, there will continue to be a great need for information to help inform these decisions, both for the current conflict and for the future.

The Purpose of the RAND Study

Despite the widespread policy interest and a committed response from DoD and the VA, fundamental gaps remain in our knowledge about the mental health needs of U.S. servicemembers returning from deployment to Afghanistan and Iraq, the adequacy of the care system that exists to meet those needs, and how veterans and servicemembers fare in that system. To address this gap and generate objective data to inform policies and programs for meeting these needs, RAND undertook the first comprehensive, independent study of these issues. The study was guided by a series of overarching questions:

- **Prevalence:** What is the scope of mental health and cognitive conditions that troops face when returning from deployment to Afghanistan and Iraq?
- **Costs:** What are the costs of these conditions, including treatment costs and costs stemming from lost productivity and other consequences? What are the costs and potential savings associated with different levels of medical care—including proven, evidence-based care; usual care; and no care?
- **The care system:** What are the existing programs and services to meet the health-related needs of servicemembers and veterans with post-traumatic stress disorder, major depression, or traumatic brain injury? What are the gaps in the programs and services? What steps can be taken to close the gaps?

To answer these questions, we designed a series of data-collection activities to accomplish four aims:

1. Identify and assess current mental health and cognitive conditions among military servicemembers and veterans who served in Afghanistan or Iraq.
2. Identify the short- and long-term consequences of untreated psychological and cognitive injuries (i.e., PTSD, major depression, TBI).

3. Document and assess the availability, accessibility, and capacity of existing programs and services to meet short- and long-term mental health and cognitive needs, as well as brain injuries, in injured servicemembers.
4. Evaluate aids and barriers to seeking care and to using services.

Scope of the Monograph

This monograph discusses the psychological and cognitive injuries associated with military deployment. It does not cover issues related to treating or caring for those individuals who suffer other combat-related physical injuries; such issues have been documented and covered by other recent task forces, commissions, and review groups. Note, however, that individuals with severe physical injuries may be at risk for developing post-deployment mental health or cognitive conditions; for this reason, this monograph will also be relevant in considering the overall care system for the severely wounded.

In this monograph, we focus on three specific post-deployment conditions: post-traumatic stress disorder, major depression, and traumatic brain injury. These conditions were chosen because of their clear link to servicemember exposures in a combat theater. PTSD is defined by its linkage to exposure to traumatic or life-threatening events, such as combat. Major depression is often linked to grief and loss, which can be salient for servicemembers who lose their comrades. TBI is the result of a service- or combat-related injury to the brain. In addition, PTSD and TBI are among the signature injuries for U.S. troops who served in Afghanistan and Iraq (President's Commission on Care for America's Returning Wounded Warriors, 2007), and concerns about suicide risk make major depression very important to study. We define each of these conditions in turn.

Post-traumatic stress disorder, or PTSD, is an anxiety disorder that occurs after a traumatic event in which a threat of serious injury or death was experienced or witnessed, and the individual's response involved intense fear, helplessness, or horror. In addition, the disorder is marked by the following symptoms occurring for more than one month and causing significant distress and/or impairment: re-experiencing the event, avoidance of stimuli relating to the event, numbing of general responsiveness, and hyperarousal (APA, 2000). A further distinction is sometimes made between PTSD and Acute Stress Reaction (ASR) and Combat (or Ongoing Military) Operational Stress Reaction (COSR). ASR is a severe but transient disorder that develops in an individual in response to exceptional physical or mental stress. Symptoms are usually minimal after about three days. COSR, also known as battle fatigue or battle shock, is any response to battle stress that renders a soldier (servicemember) transiently unable to remain on duty. COSR is distinguished from DSM-IV (*Diagnostic and Statistical Manual—Version Four*) mental disorders in that the former is by definition tran-

sient and preferably managed conservatively in the operational theater (via principles of proximity, immediacy, expectancy, and simplicity) and do not generally require traditional psychiatric management, such as ongoing psychotherapy or psychopharmacologic treatment. We focus specifically on PTSD, which is diagnosed only after symptoms have persisted for more than 30 days post-exposure.

Depression, or major depressive disorder (MDD), is a mood disorder that interferes with an individual's everyday functioning. Individuals with MDD have a persistent constellation of symptoms, including depressed mood, inability to experience pleasure, or loss of interest in almost all activities, that occur almost every day for two weeks (APA, 2000). Other symptoms can include significant weight loss or gain or a decrease in appetite; insomnia or hypersomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness or excessive or inappropriate guilt; diminished ability to think or concentrate or significant indecisiveness; and recurrent thoughts of death, suicidal ideation, or suicidal attempts or plans. In this monograph, we use the term *depression* to indicate major depressive disorder or symptoms of this disorder that may not meet full diagnostic criteria.

Traumatic brain injury, or TBI, is a trauma to the head that either temporarily or permanently disrupts the brain's function (Centers for Disease Control and Prevention, 2008). Disruptions in brain functioning can include a decreased level of consciousness, amnesia, or other neurological or neuropsychological abnormalities. TBI can also be marked by skull fracture or intracranial lesions (Thurman et al., 1995). Brain injuries can be caused by an object that pierces the skull and enters brain tissue, which is defined as a *penetrating injury*, or when the head hits an object but the object does not break through the skull, resulting in rapid acceleration-deceleration of the brain, which is defined as a *closed head injury*. Injuries from exposures to blasts cause a non-penetrating injury as well; however, it is a result of a blast wave being transmitted through the brain rather than acceleration-deceleration or an external impact to the skull itself (National Institute of Neurological Disorders and Stroke, 2002; Warden, 2006). Moreover, depending on the proximity of the servicemember to the blast, there may be associated brain trauma from the person being thrown into an object and/or objects acting as missiles that hit or penetrate the skull. Therefore, there may be multiple causes of brain injury resulting from a blast injury. The term TBI itself refers simply to the injury to the brain, whether or not it is associated with lasting functional impairment. The exact nature of the symptoms depends upon the type and severity of the injury. Measures of TBI severity include the Glasgow Coma Scale (which is scored by assessing a patient's eye-opening, motor, and verbal responses), length of loss of consciousness, and length of post-traumatic amnesia; about 80 percent of patients with known TBIs are categorized as "mild TBI" (see Chapter Seven, Appendix 7.C). However, to date there is still much ambiguity in definitions and in understanding of the possible long-term repercussions of exposure to blast, leaving large gaps in knowledge.

Each of these conditions affects mood, thoughts, and behavior, bringing with it a host of difficulties in addition to the symptoms themselves. Previous research has demonstrated significant impairments in daily lives, as well as linkages with suicide, homelessness, and substance abuse, even when a mental disorder is not diagnosed (see Chapter Five). Thus, it is important to consider the full spectrum of issues related to how the OEF/OIF veterans are transitioning back into home life and how they will fare in the years to come.

Organization of This Monograph

This volume is organized into several parts. Recognizing that some audiences will be interested in specific parts, we have made some chapters more technical than others, and we repeat main findings in each as well as in Chapter Eight, which summarizes the findings of the entire project. In the remainder of the first part (Chapter Two), we describe the population of U.S. forces serving, including those serving in Afghanistan and Iraq, and provide a brief description of the Operations. Part II details the research literature on the prevalence of mental health and cognitive conditions among OEF/OIF veterans (Chapter Three), including findings from our own survey of veterans and servicemembers to provide data on current health status, levels of probable PTSD, major depression, and TBI, as well as self-reported use of and barriers to health care (Chapter Four). In Part III, we summarize the available literature on the short- and long-term consequences associated with psychological and cognitive injuries. Part IV uses a modeling approach to estimate the costs of these conditions—in medical costs required to provide treatment and the employment effects of different outcomes, ranging from a full return to mental health to death via suicide. Part V provides an overview of the systems of care designed to treat these conditions and evaluates existing programs according to the evidence supporting the services offered within each. Part VI presents conclusions and offers recommendations for programs and policies aimed at filling gaps and improving treatment.

References

Altmire, J. *Testimony of Jason Altmire*, Hearing Before the Subcommittee on Health of the House Committee on Veterans' Affairs. Washington, D.C., 2007.

American Psychiatric Association. *Diagnostic and Statistical Manual—Version Four*. Washington, D.C., 2000.

American Psychological Association (APA). Practice guideline for the treatment of patients with major depressive disorder (revision). *American Journal of Psychiatry*, Vol. 157, No. 4 Suppl., April 2000, pp. 1–45.

Belasco, A. *The Cost of Iraq, Afghanistan, and Other Global War on Terror Operations Since 9/11*. Washington, D.C.: Congressional Research Service, 2007.

Bruner, E. F. *Military Forces: What Is the Appropriate Size for the United States?* Washington, D.C.: Congressional Research Service, 2006.

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control Web site. Traumatic Brain Injury page, 2008. As of January 25, 2008:
<http://www.cdc.gov/ncipc/factsheets/tbi.htm>

Dean, E. T., Jr. *Shook Over Hell—Post-Traumatic Stress, Vietnam, and the Civil War*. Cambridge, Mass.: Harvard University Press, 1997.

Defense and Veterans Brain Injury Center. A Congressional Program for Servicemembers and Veterans with Traumatic Brain Injury and Their Families, Informational Brochure, Washington, D.C., Walter Reed Army Medical Center, 2005.

Defense Health Board Task Force on Mental Health. *An Achievable Vision: Report of the Department of Defense Task Force on Mental Health*. Falls Church, Va.: Defense Health Board, 2007.

Department of Veterans Affairs Web site. Health Care—Veterans Health Administration page. As of July 2007:
<http://www1.va.gov/health/gateway.html>

DoD Personnel and Procurement Statistics. Military Casualty Information page. As of December 8, 2007:
<http://siadapp.dmdc.osd.mil/personnel/CASUALTY/castop.htm>

Friedman, M. J. Acknowledging the psychiatric cost of war. *The New England Journal of Medicine*, Vol. 351, No. 1, July 1, 2004, pp. 75–77.

———. Posttraumatic stress disorder among military returnees from Afghanistan and Iraq. *The American Journal of Psychiatry*, Vol. 163, No. 4, April 2006, pp. 586–593.

Glasser, R. A shock wave of brain injuries. *The Washington Post*, April 8, 2007.
<http://www.washingtonpost.com/wp-dyn/content/article/2007/04/06/AR2007040601821.html>

Government Accountability Office (GAO). *Posttraumatic Stress Disorder: DoD Needs to Identify the Factors Its Providers Use to Make Mental Health Evaluation Referrals for Service Members*. Washington, D.C., 2006.

Helmus, T. C., and R. W. Glenn. *Steeling the Mind: Combat Stress Reactions and Their Implications for Urban Warfare*. Santa Monica, Calif.: RAND Corporation, MG-191-A, 2005. As of March 4, 2008:
<http://www.rand.org/pubs/monographs/MG191/>

Hoge, C. W., J. L. Auchterlonie, and C. S. Milliken. Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *JAMA*, Vol. 295, No. 9, March 1, 2006, pp. 1023–1032.

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, July 2004, pp. 13–22.

Hoge, C. W., S. E. Lesikar, R. Guevara, J. Lange, J. F. Brundage, Jr., C. C. Engel, S. C. Messer, and D. T. Orman. Mental disorders among U.S. military personnel in the 1990s: Association with high levels of health care utilization and early military attrition. *The American Journal of Psychiatry*, Vol. 159, No. 9, September 2002, pp. 1576–1583.

Hoge, C. W., D. McGurk, J. L. Thomas, A. L. Cox, C. C. Engel, and C. A. Castro. Mild traumatic brain injury in U.S. soldiers returning from Iraq. *New England Journal of Medicine*, Vol. 358, No. 5, January 31, 2008, pp. 453–463.

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, January 2007, pp. 150–153. As of January 23, 2008:

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=17202557

Independent Review Group to Conduct an Assessment of Outpatient Treatment at Walter Reed Army Medical Center (WRAMC) and the National Naval Medical Center (NNMC). *Rebuilding the Trust*. Washington, D.C., 2007.

Jones, E., and I. P. Palmer. Army psychiatry in the Korean War: The experience of 1 Commonwealth Division. *Military Medicine*, Vol. 165, No. 4, April 2000, pp. 256–260.

Marlowe, D. H. *Psychological and Psychosocial Consequences of Combat and Deployment, with Special Emphasis on the Gulf War*. Washington, D.C.: The RAND Corporation, MR-1018/11-OSD, 2001. As of March 4, 2008:

http://www.rand.org/pubs/monograph_reports/MR1018.11/

Milliken, C. S., J. L. Auchterlonie, and 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.

National Institute of Mental Health Web site, Mental Health Topics page. As of March 28, 2008: <http://www.nimh.nih.gov/health/topics>

National Institute of Neurological Disorders and Stroke. *Traumatic Brain Injury: Hope Through Research*. NIH Publication No. 02-158, 2002. As of January 30, 2008:

<http://www.ninds.nih.gov/disorders/tbi/detail%5Ftbi.htm>

Newman, R. A. Combat fatigue: A review of the Korean Conflict. *Military Medicine*, Vol. 129, 1964, pp. 921–928.

President's Commission on Care for America's Returning Wounded Warriors. *Serve, Support, Simplify: Report of the President's Commission on Care for America's Returning Wounded Warriors*. Washington, D.C., July 2007. As of January 23, 2008:

<http://www.pccww.gov/index.html>

PubMed database, National Center for Biotechnology Information. As of August 2007: <http://www.pubmed.gov>

Rosenheck, R., and A. Fontana. Changing patterns of care for war-related post-traumatic stress disorder at Department of Veterans Affairs Medical Centers: The use of performance data to guide program development. *Military Medicine*, Vol. 164, No. 11, November 1999, pp. 795–802.

Serafino, N. M. *Peacekeeping: Issues of U.S. Military Involvement*. Washington, D.C.: Congressional Research Service, 2003.

Smith, T. C., M. A. K. Ryan, D. L. Wingard, D. J. Slymen, J. F. Sallis, D. Kritz-Silverstein, for the Millenium Cohort Study Team. 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* online, downloaded on January 16, 2008.

Thurman, D. J., J. E. Sniezek, D. Johnson, A. Greenspan, and S. M. Smith. *Guidelines for Surveillance of Central Nervous System Injury*. Atlanta, Ga.: Centers for Disease Control and Prevention, 1995.

U.S. Census Bureau. Population estimates for counties by race and Hispanic origin, 1999.

As of June 2007:

<http://www.census.gov/population/estimates/county/crh/crhga99.txt>

Warden, D. Military TBI during the Iraq and Afghanistan wars. *Journal of Head Trauma Rehabilitation*, Vol. 21, No. 5, 2006, pp. 398–402.