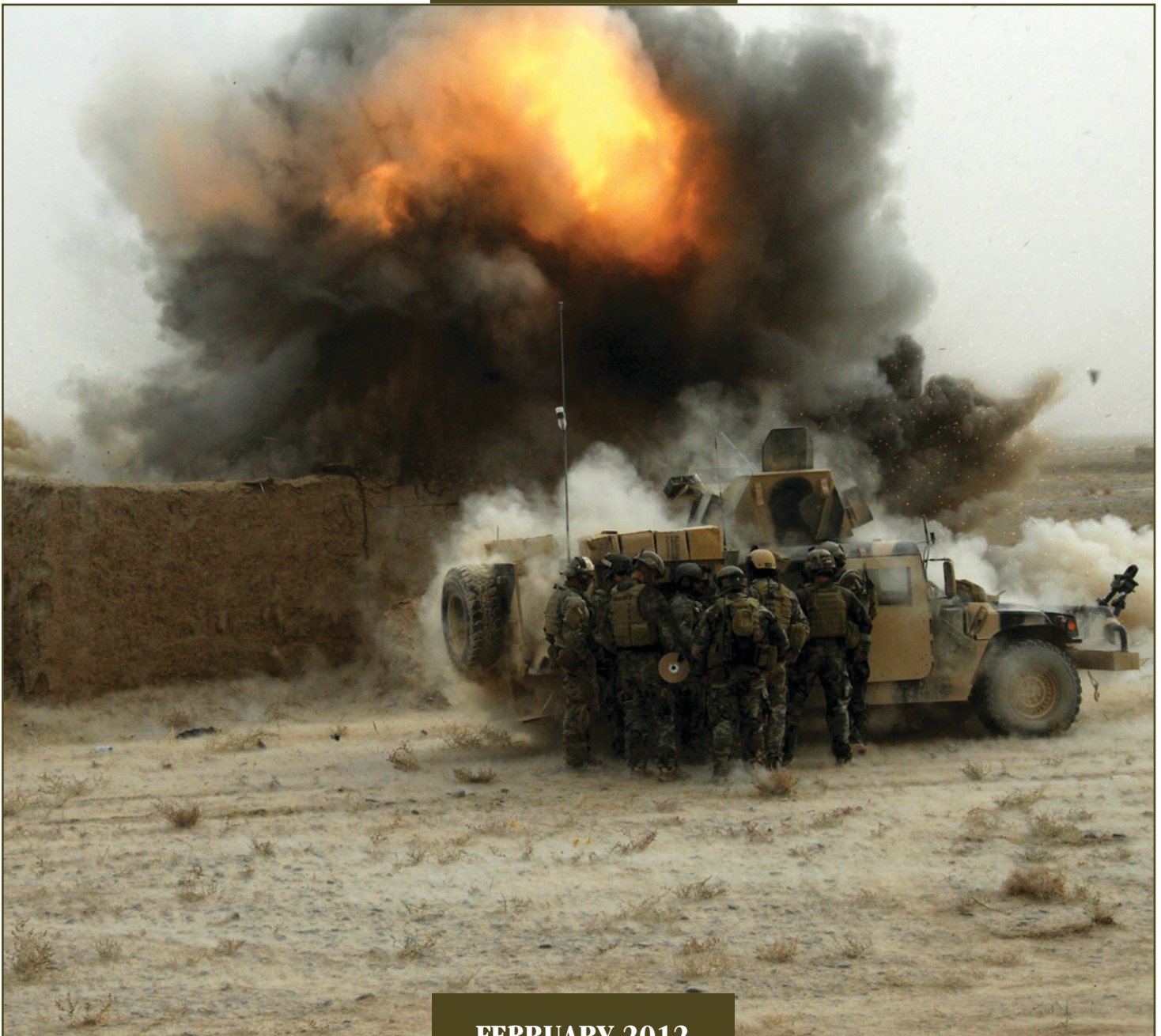
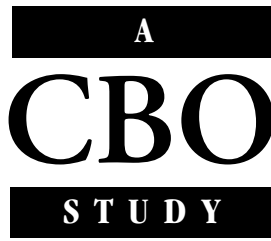


CBO

**The Veterans Health
Administration's
Treatment of
PTSD and Traumatic
Brain Injury Among
Recent Combat Veterans**



FEBRUARY 2012



The Veterans Health Administration's Treatment of PTSD and Traumatic Brain Injury Among Recent Combat Veterans

February 2012

Notes

Unless otherwise indicated, all years referred to in this study are federal fiscal years (which run from October 1 to September 30).

Unless otherwise indicated, all dollar amounts in this study are expressed in 2011 dollars. Before providing cost data to the Congressional Budget Office (CBO), the Veterans Health Administration converted those data to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit from 2004 to 2009. CBO indexed those data to 2011 dollars using the implicit price deflator for gross domestic product. CBO also converted other dollar amounts reported in this study to 2011 dollars using the implicit price deflator for gross domestic product.

Numbers in the text and tables may not add up to totals because of rounding.



Preface

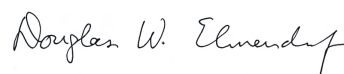
Two combat-related conditions that affect some veterans who have served in Iraq and Afghanistan and that have generated widespread concern among policymakers are post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI). In response to a request from the Ranking Member of the House Committee on Veterans' Affairs, this Congressional Budget Office (CBO) study examines the following:

- The clinical care that the Veterans Health Administration (VHA), the health care system within the Department of Veterans Affairs, provides for recent combat veterans;
- VHA's coordination with the Department of Defense for the care of service members returning from Iraq and Afghanistan;
- The prevalence of PTSD and TBI among veterans of those conflicts and the occurrence of those conditions among recent combat veterans using VHA's services; and
- The costs to VHA of providing care to recent combat veterans for those conditions.

In keeping with CBO's mandate to provide objective, impartial analysis, this study makes no recommendations.

Elizabeth Bass and Heidi Golding of CBO's National Security Division prepared the study under the general supervision of David Mosher and Matthew Goldberg. Allison Percy served as the internal reviewer. Lindsay Coleman, Juan Contreras, Sunita D'Monte, and Ann Futrell provided thoughtful comments on a draft of the study, as did external reviewer Rajeev Ramchand of RAND Corporation. (The assistance of an external reviewer implies no responsibility for the final product, which rests solely with CBO.) Adebayo Adedeji fact-checked the manuscript. The authors wish to thank the Department of Veterans Affairs and the Department of Defense for providing data used in the analysis.

Juyn Linger edited the study, and John Skeen proofread it. Cindy Cleveland produced drafts of the manuscript. Maureen Costantino prepared the paper for publication and designed the cover. Monte Ruffin printed the initial copies, and Linda Schimmel handled the print distribution. The publication is available at CBO's Web site (www.cbo.gov).



Douglas W. Elmendorf
Director

February 2012



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Summary

More than 2 million service members have deployed in support of overseas contingency operations (OCO) in Iraq and Afghanistan since October 2001. Some military service members receive medical care in the combat theater for injuries or other medical conditions sustained while deployed. Other service members have combat-related medical conditions that are identified and treated after they return from war—within the Department of Defense’s (DoD’s) health care system for active-duty personnel and within the Department of Veterans Affairs (VA) for veterans, including deactivated reservists. VA provides health care services through the Veterans Health Administration (VHA), which treats veterans for service-connected conditions and other conditions.

VHA spent about \$2 billion (in 2011 dollars) in fiscal year 2010 to treat veterans of recent overseas contingency operations, compared with total expenditures in 2010 on health care for veterans of all eras and conflicts of about \$48 billion. From 2002 through 2010, VHA spent a total of \$6 billion on health care expenditures for recent OCO veterans.

Two conditions that affect some military service members during deployment to a combat theater and afterward are post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI). PTSD is an anxiety disorder induced by exposure to a traumatic event, such as witnessing injury or death. It is characterized by symptoms that include reexperiencing the event, hyperarousal (irritability, anger, or hypervigilance, for example), and diminished responsiveness to or avoidance of stimuli associated with the trauma.

TBI is caused by sudden trauma to the head and is commonly sustained by soldiers exposed to explosions. It may result in a decreased level of consciousness, amnesia, or

neurological abnormalities, and it is classified as mild, moderate, or severe on the basis of its severity at the time of the injury. Mild TBI, which is also known as a concussion, may in some cases lead to ongoing symptoms that include headaches, memory difficulties, fatigue, irritability, and sleep problems. Diagnosing severe cases is straightforward, but mild TBIs—which account for about 90 percent of TBI cases among active-duty OCO service members—may be difficult to detect, both by those afflicted and by health care professionals, although most cases resolve quickly without medical intervention.¹

Some observers contend that DoD and VHA may not adequately screen, diagnose, and treat OCO service members and veterans affected by PTSD and mild TBI. In this study, the Congressional Budget Office (CBO) analyzes VHA’s care of OCO patients diagnosed with PTSD or TBI and compares the reported rates of occurrence of those conditions within VHA with estimates of the prevalence of those conditions in the broader population of service members who have deployed to recent overseas contingency operations. (Prevalence estimates gauge the proportion of cases of a disease or condition in a population, whether or not people have received a diagnosis from a medical professional; by comparison, the reported occurrence of conditions among the people who have been treated within VHA reflects counts of diagnoses by medical professionals.) The study also examines the costs that VHA has incurred in treating patients diagnosed with PTSD and TBI.

1. Diagnosis of mild TBI with persistent symptoms is complicated because the condition does not have a clinically validated definition—that is, a definition that is based on a substantive body of empirical research and is broadly accepted by the medical community. Moreover, many other conditions cause symptoms that are similar to those of mild TBI.

Summary Table 1.**The First Year of Treatment for All Health Care Provided to OCO Patients by VHA**

Treatment Group	Average Cost per Patient (Dollars)	Number of OCO Patients	Share of All OCO Patients (Percent)
PTSD or TBI			
PTSD ^a	8,300	103,500	21
TBI ^b	11,700	8,700	2
Both PTSD and TBI	13,800	26,600	5
No PTSD or TBI	2,400	358,000	72
Polytrauma	136,000	500	*

Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for the first year of treatment.

All of the TBI patients in the data that CBO examined had symptomatic TBI—that is, they exhibited symptoms that were attributed to TBI at the time of VHA's medical screening or examination.

VHA converted costs provided to CBO to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit from 2004 to 2009. CBO then indexed those costs to 2011 dollars using the implicit price deflator for gross domestic product.

OCO = overseas contingency operations; VHA = Veterans Health Administration; PTSD = post-traumatic stress disorder;

TBI = traumatic brain injury; * = less than 1 percent.

- a. Patients in the PTSD group did not have TBI, but many had other conditions.
- b. Patients in the TBI group did not have PTSD, but many had other conditions.

In brief, CBO finds:

- Among OCO patients treated by VHA from 2004 through 2009, 21 percent were diagnosed with PTSD (but not TBI) and 2 percent with symptomatic TBI (but not PTSD) (see Summary Table 1).² An additional 5 percent had both PTSD and TBI; thus, about 75 percent of those diagnosed with TBI had a concurrent diagnosis of PTSD. Seventy-two percent of patients had neither diagnosis. (CBO separately analyzed another 500 polytrauma patients—that is, ones with complex, severe injuries to multiple organ systems.)
- The average cost for OCO patients in the first year of their treatment was about four to six times greater for patients with a diagnosis of PTSD, TBI, or both than for patients without those conditions.

- VHA's average costs for OCO patients were highest during the first year of care and generally declined and then stabilized in subsequent years.
- For patients with TBI (including those with both PTSD and TBI), however, VHA's average treatment costs appear to increase in the third and fourth years of care. That result is probably driven by a policy change that occurred in the middle of the period that CBO analyzed and the nature of the data that VHA provided to CBO.³ In the absence of the policy change,

2. All of the TBI patients in the data that CBO examined had symptomatic TBI—that is, they exhibited symptoms that were attributed to TBI at the time of VHA's medical screening or examination.

3. VHA's clinical practices for TBI changed during the data period (2004 to 2009): In 2007, the agency initiated comprehensive screening for mild, symptomatic TBI. Therefore, patients whom VHA diagnosed with TBI in 2007 or later were more likely to have had mild TBI than those diagnosed before that year. As a result, the data that CBO analyzed included a smaller share of patients with mild TBI in their third and fourth years of treatment than in their first and second years. Because treating patients with moderate or severe TBI requires more extensive services and resources than does treating patients with mild TBI, that difference elevated the estimated average costs of treatment for TBI patients in the third and fourth years.

costs for those patients probably also would have been highest during the first year of care and then declined and stabilized thereafter.

- A great deal of uncertainty surrounds the prevalence of PTSD and TBI within the OCO population and, hence, the number of veterans with those conditions that DoD, VHA, and other health care providers may encounter in the future.

Projecting the future costs of treating veterans with PTSD and TBI requires estimating both the number of patients with those conditions who will seek VHA's care and the costs per patient that VHA will incur. Because the research community has not reached a consensus about the prevalence of those conditions, such projections would be highly uncertain. CBO examined published studies that reported the prevalence of PTSD or TBI among different groups of service members or veterans who had deployed to overseas contingency operations. For PTSD, those prevalence estimates have generally ranged between 5 percent and 25 percent. For TBI, those estimates indicate that between 15 percent and 23 percent of service members may have experienced a TBI while deployed to an overseas contingency operation but that a smaller share, between 4 percent and 9 percent, are still symptomatic when screened after returning to the United States. Estimates of the preva-

lence of PTSD and TBI vary widely among studies because of substantial differences in the assessment tools that researchers use to identify the conditions, the stringency of the criteria they employ, and the subgroups they sample. The percentage of OCO veterans whom VHA clinicians have diagnosed with PTSD (26 percent) is at the top of the range reported in published studies, whereas the percentage they have diagnosed with symptomatic TBI (7 percent) is in the middle of the reported range.

The rates of diagnosis of PTSD and TBI among OCO veterans seeking treatment at VHA do not necessarily reflect the prevalence of those conditions in the entire OCO population. If veterans who suspected they had mental health or other medical problems were more likely than other veterans to seek medical care from VHA, the rates of PTSD and TBI diagnosed among VHA's patients would tend to overestimate the prevalence in the entire OCO population. However, some veterans might not seek care from VHA for various reasons—the stigma associated with having a mental health problem, for example, or the inconvenience of undergoing additional evaluation and treatment. If a sufficient number of veterans with PTSD and TBI did not seek care from VHA, the rates of diagnoses for those conditions among VHA's patients would tend to underestimate the prevalence in the OCO population.



The Veterans Health Administration's Treatment of PTSD and Traumatic Brain Injury Among Recent Combat Veterans

Introduction

The United States has been involved in overseas contingency operations (OCO) in Afghanistan and Iraq since October 2001 and March 2003, respectively, and has deployed more than 2 million service members in support of those operations. The Department of Defense (DoD) delivers medical care to service members while they are deployed. That care includes nearly 4 million medical encounters since January 2005 for a variety of conditions, including injuries; it also includes 71,000 medical evacuations of service members from the combat theaters through November 2011. Both DoD and the Veterans Health Administration (VHA), the organization that provides medical care within the Department of Veteran Affairs (VA), screen for various conditions and provide health care after service members return from deployment. VHA treated 400,000 (31 percent) of 1.3 million eligible OCO veterans in fiscal year 2010, up from 100,000 (20 percent) of 500,000 eligible OCO veterans in 2005. Many eligible veterans do not seek care at VHA in any given year or at any time, and most VHA patients seek additional health care outside of VHA. (See Box 1 for information about eligibility for VHA's health care system.) Although OCO veterans made up 7 percent of the patients VHA treated in 2010, they accounted for only 4 percent (\$2 billion) of the \$48 billion (in 2011 dollars) that VHA obligated for medical care that year. From 2002 through 2010, VHA spent a total of \$6 billion on health care for OCO veterans.¹

Two medical conditions that may affect OCO veterans have received particular attention: post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI). PTSD is an anxiety disorder triggered by a traumatic event, such as may occur when engaging in combat;

witnessing serious injury, brutality, or unnatural death, particularly of another soldier; or suffering a severe vehicle accident, including those caused by improvised explosive devices (IEDs). The symptoms of PTSD include reexperiencing the event, hyperarousal (irritability, anger, or hypervigilance, for example), and diminished responsiveness to or avoidance of stimuli associated with the trauma. TBI is a blow to the head that alters a person's consciousness, if only momentarily. TBI may result in amnesia or neurological abnormalities at the time of injury. In the combat theater, explosions from IEDs or other bombs are a leading cause of TBI among military personnel, although TBIs also result from falls, motor vehicle accidents, and bullet wounds.² TBI is classified as mild, moderate, or severe on the basis of its severity at the time of injury. (That classification refers to the acuteness of initial symptoms only, not to that of persistent symptoms.) Mild TBI, also known as a concussion, typically resolves quickly without medical treatment, in many cases within weeks and in most cases within three months. Although some symptoms may linger for six months or more, there is considerable debate over whether those persistent symptoms can be attributed to mild TBI or to other

1. For a recent overview of those costs, see the statement of Heidi L. W. Golding, Principal Analyst for Military and Veterans' Compensation, Congressional Budget Office, before the Senate Committee on Veterans' Affairs, *Potential Costs of Health Care for Veterans of Recent and Ongoing U.S. Military Operations* (July 27, 2011).
2. Defense and Veterans Brain Injury Center, TBI Facts, accessed June 27, 2011, at www.dvbic.org/TBI---The-Military/TBI-Facts.aspx.

Box 1.**Eligibility for VHA's Services**

Eligibility for the health care system of the Veterans Health Administration (VHA) is based primarily on a veteran's military service. Generally, veterans of the active components of the military must have served 24 continuous months on active duty to be eligible; reservists and National Guard members may be eligible if they are called to active duty under a federal order and they complete that service. Those broad criteria, however, do not necessarily guarantee access to medical treatment. VHA operates an enrollment system that assigns a veteran to one of eight categories to establish his or her priority for using its health care services. Veterans with higher priority include those who have service-connected disabilities, low income, or both. In January 2003, VHA imposed a general freeze (with some subsequent modifications) on new enrollments in the lowest priority group (Priority Group 8).¹

The Veterans Programs Enhancement Act of 1998 (Public Law 105-368) guarantees access to VHA's health care system, after separation from active mili-

1. Veterans in Priority Group 8 are those who have no service-connected disabilities (or, according to a determination by the Department of Veterans Affairs [VA], have service-connected disabilities that are ineligible for monetary compensation) and have annual income or net worth above VA's means-test threshold and regional income threshold. See www.va.gov/healtheligibility/Library/AnnualThresholds.asp.

tary service, to members of the armed forces who have served on active duty in combat operations since the law was enacted in November 1998; reservists and members of the National Guard who have served in combat operations are also included under that guarantee. The law gave combat veterans two years (starting from their date of separation from the military) to enroll and use VHA's health care system without requiring those veterans to document either that their income is below established thresholds or that they have a service-connected disability—requirements that noncombat veterans must fulfill. In 2008, lawmakers extended the enhanced eligibility period for care through VHA's health care system to five years.² Under those legislative authorities, VHA provides free health care for medical conditions directly or potentially related to a veteran's military service in combat operations for five years after separation. Veterans who had deployed to overseas contingency operations (OCO) may continue to use VHA's services when the five-year period of enhanced eligibility ends, but their priority group for enrollment may change, depending on their disability status and income. In particular, OCO veterans may be moved to a lower priority group, including Priority Group 8, and incur the applicable copayments.

2. See title XVII of the National Defense Authorization Act for Fiscal Year 2008, P.L. 110-181, 122 Stat. 493.

conditions.³ (See Appendix A for more detailed information about PTSD and TBI.)

Few service members have been evacuated from combat theaters as a result of PTSD or TBI alone, although many have been evacuated for TBI in conjunction with other

injuries. Many cases of PTSD and TBI may go unrecognized and consequently undiagnosed and untreated, both in the combat theater and once the service member returns home. PTSD can interfere with daily functioning when it results in emotional withdrawal from family and friends, inappropriate expressions of anger, irritability, overprotective behaviors, or substance abuse. Those with ongoing mild TBI may feel sad, nervous, or agitated; have difficulty concentrating and sleeping; and experience sensitivity to noise or light. Those with moderate or severe TBI may experience similar difficulties but also have more complex physical and neurological limitations, which in some cases affect their ability to live

3. For further discussion, see Susanne Meares and others, "The Prospective Course of Postconcussion Syndrome: The Role of Mild Traumatic Brain Injury," *Neuropsychology*, vol. 25, no. 4 (July 2011), pp. 1–12; and Charles W. Hoge and others, "Care of War Veterans with Mild Traumatic Brain Injury—Flawed Perspectives," *New England Journal of Medicine*, vol. 360, no. 16 (April 16, 2009), pp. 1588–1591.

independently. Symptoms manifest themselves in different ways and with different intensity across people and situations; some people function well in some settings but not in others.

Some policymakers have questioned whether DoD and VHA have the resources and capacity to serve the OCO population with PTSD and TBI. Some observers are also concerned about whether service members and veterans with those conditions are reluctant to seek the help they need. In this study, the Congressional Budget Office (CBO) examines the clinical care provided by VHA for OCO veterans with PTSD and TBI, VHA's coordination with DoD for the care of service members and veterans, the rate of occurrence of PTSD and TBI among VHA patients and the estimated prevalence of those conditions in the broader population of recent OCO veterans, the use of VHA's health care services by OCO veterans who have been diagnosed with PTSD or TBI, and the costs of providing that care. Because the prevalence of PTSD and TBI in the OCO population is highly uncertain, CBO has not projected VHA's future costs for treating veterans with those conditions.

Clinical Care Within VHA

To serve the growing population of veterans, VHA has hired more than 7,500 mental health professionals since 2005 and has established specialized rehabilitation centers for veterans with multiple complex injuries, including TBI. Further, VHA offers a broad range of services and programs tailored specifically to OCO patients with PTSD and TBI. In this section, CBO presents a brief overview of typical strategies for diagnosing PTSD and TBI, along with treatment options that VHA provides for those conditions.

VHA's Services for PTSD

As of September 2011, mental health diagnoses were the second largest diagnostic category among OCO veterans who had received health care services from VHA, affecting 52 percent of those patients.⁴ VHA delivers PTSD care in primary care settings and in specialized programs of evaluation, treatment, and education. Through its electronic national clinical reminder system, VHA

endeavors to administer a screening test for various medical conditions, known as the Iraq and Afghan Post-Deploy Screen, to all OCO patients.⁵ That screen includes the Primary Care PTSD (PC-PTSD) screen, which consists of four questions. VHA's policy is to screen for PTSD every year for the first five years a veteran uses VHA care and once every five years thereafter, except in cases in which a clinical need for more frequent screening has been identified.

Veterans who screen positive for PTSD are referred for additional evaluation. For most patients, further assessment is provided by a mental health professional such as a psychiatrist, psychologist, or trained clinician. That assessment typically takes place at a follow-up appointment, although additional evaluation or a diagnosis may occur during the visit when the screening occurs. VHA clinicians make their diagnoses according to the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM), which delineates the professionally certified criteria for mental disorders in the United States. Diagnoses are made using a variety of diagnostic tools, often in combination, such as structured interviews (the Clinician-Administered PTSD Scale), semistructured interviews (the Structured Clinical Interview for DSM Disorders), and self-reported evaluations (the PTSD Checklist).

Although PTSD has a well-validated case definition and diagnostic criteria, it can nonetheless be difficult to diagnose and treat. First, some OCO veterans and service members do not seek treatment for mental health problems. Despite widespread outreach programs within the military and VHA, the stigma associated with mental health disorders may discourage veterans from scheduling an appointment for an assessment or from requesting treatment, and fear of harming one's military career may inhibit service members from seeking treatment while they are on active duty. Second, as with many mental health disorders, there is no objective measure, such as a laboratory test result, for confirming a diagnosis of PTSD. Third, some PTSD symptoms—for example, irritability, emotional numbing, insomnia, and trouble concentrating—also occur with other conditions. Fourth, PTSD can impair judgment, especially if combined with

4. The largest category of diagnoses—diseases of the musculoskeletal system or connective tissue system—applied to 56 percent of OCO patients. Veterans may receive diagnoses in more than one category, so the percentages of patients with different diagnoses sum to more than 100 percent.

5. The screen for deployment-related health risks includes questions designed to detect depression, alcohol abuse, and TBI, in addition to those relating to PTSD. The screen may be given in one of several venues but commonly occurs during a primary care visit.

associated conditions such as substance abuse, and thereby make it more difficult for veterans with PTSD to seek or maintain treatment.

VHA provides treatment for PTSD at VHA hospitals, outpatient clinics, community-based outpatient clinics (CBOCs), and Vet Centers.⁶ In addition, VHA pays for some care delivered through outside providers. VHA reports that treatment for PTSD is commonly delivered in outpatient clinics and CBOCs, either through general mental health clinics or, less commonly, through specialized programs provided by PTSD Clinical Teams, Substance Use PTSD Teams, and Women's Stress Disorder Treatment Teams. VHA guidelines instruct clinicians to tell patients to expect about six months of treatment, but for patients with severe cases of PTSD or multiple diagnoses of mental health disorders, treatment may extend for one to two years or longer. For many veterans, PTSD oscillates between remission and relapse. The National Center for PTSD reports that some veterans may never be free of symptoms; rather, patients may learn coping mechanisms that allow them to function in private and public spheres. One of VHA's treatment goals is to help veterans develop those mechanisms.⁷

Treatment for PTSD is tailored to the patient and may include a combination of psychotherapy (treatment based on psychology techniques) and pharmacotherapy (treatment using prescription drugs). In addition, all treatment programs for PTSD in VHA provide education for families and veterans (including coping mechanisms).

VHA offers two forms of evidence-based psychotherapy—that is, therapy based on a substantive body of empirical research broadly accepted by the medical community. Those therapies are cognitive processing therapy (CPT) and prolonged exposure (PE) therapy. CPT helps patients change the way the trauma is perceived—for example, by replacing blame and guilt with less distress-

ing thoughts. In PE therapy, the traumatic events are narrated repeatedly and combined with exercises to reduce anxiety in specific situations. The Institute of Medicine has concluded that exposure therapies, such as PE therapy, or other therapies that include exposure as part of treatment, such as CPT, are the only types of psychotherapy that have been found effective for PTSD; however, the Institute also noted evidence that the effectiveness of exposure therapies for veterans is not as strong as for civilians.⁸ Other therapies used by VHA include group and family therapy.

Clinical research suggests that PTSD patients who undergo therapy require at least nine treatment sessions.⁹ VHA reported to CBO that 40 percent of OCO veterans initiating CPT or PE therapy complete a full course of therapy. Typically, VHA patients undergoing CPT meet one on one with a therapist for an hour each week; for patients undergoing PE therapy, VHA typically schedules one 90-minute session each week. VHA data from internal program evaluations indicate that OCO veterans who completed PE therapy attended an average of 11 sessions, whereas those who did not complete therapy attended an average of 5 sessions; results were similar for patients undergoing CPT. Additional data from a recently published study found that 80 percent of OCO veterans who used VHA's services and received new PTSD diagnoses had at least one follow-up visit; nonetheless, fewer than half completed the recommended treatment sessions within one year.¹⁰ The reasons for not completing a full course of therapy may include the following: the distance between home and the location of care, a preference for receiving mental health care from providers outside VHA, difficulty scheduling appointments, negative perceptions of mental health care, and impaired judgment as a result of either the condition itself or associated problems such as substance abuse.

Pharmacotherapy in VHA consists mainly of the use of antidepressants, such as selective serotonin reuptake

6. In addition to providing clinical care services, VHA operates about 300 Vet Centers for veterans and their families at no out-of-pocket cost. Vet Centers offer readjustment services such as individual and family counseling, assistance in applying for VHA benefits, and information on other community and educational opportunities. Veterans using those services need not be enrolled for VHA's health care services, and they retain anonymity for any counseling they receive.

7. For more information, see VHA's National Center for PTSD Web site at www.ptsd.va.gov/public/index.asp.

8. Institute of Medicine, *Treatment of Posttraumatic Stress Disorder: An Assessment of the Evidence* (Washington, D.C.: National Academies Press, 2008).

9. Karen Seal and others, "VA Mental Health Services Utilization in Iraq and Afghanistan Veterans in the First Year of Receiving New Mental Health Diagnoses," *Journal of Traumatic Stress*, vol. 23, no. 1 (February 2010), pp. 5–16.

10. Ibid.

inhibitors (SSRIs) and serotonin norepinephrine reuptake inhibitors (SNRIs). If unsuccessful, treatment may expand to mood stabilizers, anticonvulsants, antipsychotics, or other agents to alleviate symptoms such as anxiety, intrusive thoughts, flashbacks, and insomnia. In one study, VHA researchers determined that pharmacotherapy was more likely to be prescribed for patients receiving a diagnosis in a mental health clinic than for those diagnosed in a general medical or PTSD clinic.¹¹

A small share of OCO patients with PTSD diagnoses undergoes psychiatric hospitalization—5 percent through 2010. Such hospitalizations include both traditional inpatient stays and specialized programs involving short residential stays; those stays involve counseling and treatment with social, vocational, and recreational therapies.

VHA's Services for TBI

TBI is classified as mild, moderate, or severe on the basis of its severity at the time of the injury. Because moderate and severe TBIs are easily identified and require immediate attention, acute care for combat-related TBIs is given by DoD, whereas VHA provides rehabilitation care. Moderate and severe TBIs are clinically different from mild TBIs, and their treatment typically involves substantially more health care resources. Veterans who experienced moderate or severe TBIs may receive inpatient rehabilitative care, outpatient rehabilitative care, or both, through programs that specialize in treating complex patients. Along with occupational, cognitive, physical, and other therapies, VHA also provides advanced technologies to veterans with ongoing needs related to sensory impairment, communication deficits, mobility, and self-care. The course of treatment prescribed and the services provided vary significantly by patient and are tailored to the severity of the TBI and ongoing problems.

Veterans with mild TBI are also eligible for VHA's TBI rehabilitation programs, but they are usually treated on an outpatient basis for less intense clinical symptoms and for a much shorter duration than moderate and severe TBI patients. In April 2007, VHA directed that all OCO veterans who use VHA and have not received a prior diagnosis for TBI be screened for symptomatic TBI—

that is, TBI with currently occurring symptoms such as headaches, memory difficulties, or sleep problems. Because moderate and severe cases are readily detected, the purpose of this screen, in effect, is to identify mild TBI. Since April 2007, questions designed to detect TBI have been included in VHA's Iraq and Afghan Post-Deploy Screen. For those who screen positive, additional evaluation takes place with the patient's agreement; in the absence of that consent, VHA requires that the patient's refusal to undergo further evaluation be documented. Through 2009, approximately one in five OCO veterans screened positive for symptomatic TBI. Two-thirds of those screening positive (or 14 percent of all screened patients) completed a comprehensive evaluation (some of those may not have undergone further testing because symptoms had resolved before the full evaluation was conducted). Of the 14 percent receiving a comprehensive evaluation, VHA clinicians diagnosed symptomatic TBI in one-half of those who screened positive (or 7 percent of all those initially screened).¹²

Some VHA medical facilities use individual neurologists, rehabilitation physicians, or psychiatrists for the follow-up evaluation, whereas others refer patients to an interdisciplinary team. Evaluation includes a complete history of injury, a physical exam, and a neurobehavioral inventory of TBI symptoms. Other diagnostic tools for TBI are limited. In some cases, a veteran's medical records from DoD are incomplete or unavailable, because DoD's and VHA's medical systems are not fully integrated. Correct diagnosis is problematic, as none of the symptoms of TBI are unique to that condition, and there is no clinically validated definition for TBI with persistent symptoms months after injury. Thus, many of the difficulties in diagnosing and treating PTSD also apply to symptomatic TBI: Some veterans may not seek care;

11. Michele R. Spont and others, "Treatment Receipt by Veterans After a PTSD Diagnosis in PTSD, Mental Health, or General Medical Clinics," *Psychiatric Services*, vol. 61, no. 1 (January 2010), pp. 58–63.

12. David Cifu, National Director of VA's Physical Medicine and Rehabilitation Office, "The Veterans Health Administration Polytrauma System of Care" (PowerPoint slides transmitted via e-mail, May 2010). There is some controversy surrounding estimates of the prevalence of symptomatic TBI. Headaches, concentration and memory problems, fatigue, irritability, and sleep disturbance are common symptoms seen in veterans returning from war, as well as in individuals with other medical conditions. Whether symptoms that occur months or years after a TBI can be unequivocally attributed to mild TBI, as opposed to other conditions, has been the subject of considerable debate. See Charles Hoge and others, "Care of War Veterans with Mild Traumatic Brain Injury—Flawed Perspectives," *New England Journal of Medicine*, vol. 360 (April 16, 2009), pp. 1588–1591.

there is no objective diagnostic tool to confirm the diagnosis; symptoms may coincide with those of other conditions; and VHA's diagnostic process often relies heavily on the veteran's memory, which may be impaired as a result of TBI or another medical condition.¹³

After confirmation of the diagnosis, additional physical examinations, laboratory tests, and psychosocial evaluations may be performed.¹⁴ Because there is no standard treatment regimen, a team of clinicians typically evaluates the results and determines a treatment plan, which accounts for concurrent disorders. According to VHA's guidelines, patients with symptoms persisting beyond four to six weeks of treatment should be reassessed, assigned to a case manager, and receive treatment for their remaining symptoms.

VHA considers the management of physical, behavioral, and cognitive symptoms fundamental to treatment of mild TBI. The two mainstays of treatment are symptom-specific treatment (such as managing headache pain, the most common symptom of TBI) and educating patients on their expected recovery. VHA states that treatment through primary care clinics is appropriate for managing TBI when implemented by an interdisciplinary team of rehabilitation therapists, pharmacists, and mental health clinicians. Pharmacotherapy is sometimes used alone or in conjunction with other therapies to treat musculoskeletal pain, anxiety, or psychiatric symptoms. However, there is currently no clinically validated pharmacotherapy to improve neurocognitive function after a mild TBI. As with PTSD, providing education for veterans and families about TBI is an important part of treatment. VHA's guidelines advise providers to reassure patients and their families that mild TBI is normally transient and full recovery without permanent damage is expected. Duration of treatment for mild TBI at VHA is normally one to three months, with follow-up four to six weeks later to confirm recovery, which is defined as the resolution of

13. For a more extensive discussion of the challenges that VHA clinicians face in diagnosing TBI, see Heather Belanger and others, "The Veterans Health Administration's System of Care for Mild Traumatic Brain Injury: Costs, Benefits, and Controversies," *Journal of Head Trauma Rehabilitation*, vol. 24, no. 1 (2009), pp.4–13.

14. Information presented in this and the following paragraph is from a document prepared jointly by the Department of Veterans Affairs and the Department of Defense, *VA/DoD Clinical Practice Guideline for Management of Concussion/Mild Traumatic Brain Injury*, April 2009.

symptoms and normal functioning. For some patients, however, symptoms may persist beyond six months to a year or longer. Further evaluation for other conditions may be indicated for persistent symptoms.

Concurrent Diagnoses of PTSD and TBI

TBIs sustained in Iraq or Afghanistan are often the result of explosions and involve other injuries; moreover, PTSD has been shown to occur more commonly in veterans with combat-related concussions (mild TBIs) than in those with other injuries. The Institute of Medicine's Committee on Gulf War and Health found evidence, albeit limited, suggesting that TBI and PTSD are associated.¹⁵ CBO's analysis of VHA data found that three-quarters of OCO patients with a TBI diagnosis also had a diagnosis of PTSD and that one-fifth of OCO patients with a PTSD diagnosis also had a diagnosis of TBI.¹⁶

Because PTSD and TBI may generate many of the same symptoms, a person who has both conditions may be diagnosed for only one and not the other or, alternatively, diagnosed with both but have only one condition. Medical consensus is lacking on the accuracy of screening and diagnosis for both conditions if the person has concurrent PTSD and TBI. Diagnosing only one of the conditions when both are present can lead to difficulties with treatments. For example, treatments for either mild TBI or PTSD alone may not be effective for patients with both conditions, as cognitive impairment may hinder adherence to treatment.

Polytrauma

VHA uses the designation "polytrauma" to describe complex, severe injuries to multiple organ systems that often

15. Institute of Medicine, *Gulf War and Health*, vol. 7, *Long-Term Consequences of Traumatic Brain Injury* (Washington, D.C.: National Academies Press, 2009).

16. Another study reported that among soldiers who had just returned from a deployment to Iraq, about one-third who reported suffering a mild TBI also screened positive for PTSD. See Lisa Brenner and others, "Traumatic Brain Injury, Posttraumatic Stress Disorder, and Postconcussive Symptoms: Symptom Reporting Among Troops Returning from Iraq," *Journal of Head Trauma Rehabilitation*, vol. 25, no. 5 (September-October 2010), pp. 307–312. There is some evidence that PTSD explains most or all symptoms in OCO veterans with concussions. See Charles W. Hoge and others, "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.

result from the same event, such as an explosion. Those may include brain injury, amputation, hearing and vision impairments, spinal cord injuries, and psychological trauma. A small number of patients who have those complex injuries are treated in VHA's Polytrauma System of Care, which provides comprehensive, interdisciplinary rehabilitation and other care for seriously disabled patients. The Polytrauma System of Care includes five Polytrauma Rehabilitation Centers for inpatient rehabilitation, as well as secondary sites and clinical teams for postdischarge care.¹⁷

Cooperation Between VHA and DoD

Soon after the conflicts in Afghanistan and Iraq began, it became apparent that some wounded service members were encountering significant difficulties when making the transition from DoD's health care system to VHA's. To address those concerns, DoD and VHA have increased their cooperation and have devoted more resources to encouraging service members and veterans to seek care.¹⁸

In the summer of 2007, DoD and VHA instituted the Wounded, Ill, and Injured Senior Oversight Committee to address problems specific to those service members, which include the coordination of health care management, disability evaluation, and transition of OCO service members' health care from DoD to VHA.¹⁹ The committee has several work groups charged with addressing particular issues, including one that focuses on the needs of service members and veterans with PTSD and TBI.

The Wounded Warrior Act, part of the National Defense Authorization Act for Fiscal Year 2008 (Public Law 110-181, sections 1601–1676) required DoD and VHA to

implement many initiatives, including reducing waiting time for medical care, consolidating their disability evaluation systems, and establishing standards to determine whether and when wounded service members could return to active duty. The law also mandated that the Government Accountability Office (GAO) deliver progress reports on those initiatives to the Congress. In its July 2009 report, GAO found that although DoD and VHA had not fully developed or implemented the requirements of the Wounded Warrior Act, they had made considerable progress.²⁰

DoD and VHA have targeted the coordination of health care management to service members with TBI or with PTSD and other mental health conditions. In particular, the agencies are collaborating on myriad issues such as screening, diagnosing, and treating those conditions, as well as assisting service members in their transition from DoD's health care system to that of VHA. One result of that collaboration is the TBI screen used by VHA, which was derived from the screen first used by DoD at certain military bases. DoD and VHA have formed joint committees, such as the VHA/DoD Mental Health Working Group; participate in joint research ventures, such as the Defense and Veterans Brain Injury Center; and share clinical practice guidelines, such as *Management of Concussion/Mild Traumatic Brain Injury*.²¹ DoD and VHA clinicians may collaborate on service members' transition to VHA's care; however, the proliferation of programs and case managers can be confusing for service members and has led to some duplication of efforts.²²

Because the sharing of medical records between DoD and VHA would greatly facilitate the transition of service members between the agencies, the Wounded Warrior Act included provisions designed to achieve such sharing;

17. The five centers are located in Minneapolis, Minn.; Palo Alto, Calif.; Richmond, Va.; Tampa, Fla.; and San Antonio, Tex. For more information, see VHA's Polytrauma/TBI System of Care Web site at www.polytrauma.va.gov.

18. VHA, for example, created a Mental Health Enhancement Initiative to provide funding to facilitate greater community outreach, place PTSD specialists or treatment teams in each VHA Medical Center, and expand evidence-based care for PTSD.

19. The Wounded, Ill, and Injured Senior Oversight Committee is among numerous review groups, task forces, and commissions that have examined or are currently charged with improving the care and benefits that DoD and VA provide to service members and veterans.

20. Government Accountability Office, *DOD and VA Have Jointly Developed the Majority of Required Policies but Challenges Remain*, GAO-09-728 (July 2009).

21. The Defense and Veterans Brain Injury Center became one of the component centers of the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury, an umbrella organization that was established in November 2007. For more information, see the Defense Centers of Excellence Web site at www.dcoe.health.mil.

22. Robin M. Weinick and others, *Programs Addressing Psychological Health and Traumatic Brain Injury Among U.S. Military Service-members and Their Families* (Santa Monica, Calif.: RAND Corporation, 2011).

however, that objective remains a work in progress. DoD and VHA do have complex sharing agreements and information-exchange projects to coordinate their independent record systems. For example, DoD can transfer the medical records of service members who have separated from DoD and are eligible for VHA care through the Federal Health Information Exchange. Moreover, health care clinicians for DoD and VHA can access records for patients treated by providers in either agency through the Bidirectional Health Information Exchange. Yet technical and organizational challenges have made it difficult to construct a unified electronic medical record. The Virtual Lifetime Electronic Record (VLER)—a joint effort of DoD and VHA—overcame a major hurdle in 2010 when DoD and VHA agreed to use a common personal identifier. Slated for VHA-wide implementation in 2012, the VLER is a single electronic record that would be used to manage comprehensive administrative and medical information for service members throughout their lives, from enlistment to death, regardless of health care provider.

Current record-sharing goals for VHA and DoD extend to a broader effort with the private sector, the Nationwide Health Information Network (NwHIN).²³ This group of federal agencies and private organizations has agreed to securely share patients' health information electronically among providers and health care systems by defining standards, services, and policies. Pilot projects for NwHIN are under way; veterans who agree to participate allow their public- and private-sector health care providers to share specific health information.

CBO's Analytical Approach to VHA Data

In this study, CBO presents data on the use of VHA's health care services between fiscal years 2004 and 2009 by OCO veterans who received a diagnosis of PTSD or TBI.^{24,25} CBO also presents estimates of the costs that VHA has incurred to treat OCO veterans with PTSD, TBI, or both during that period and compares them with

the costs of providing care to OCO patients who do not have PTSD or TBI.²⁶ CBO's estimates are based on VHA's cost data and do not include expenditures by other federal providers of health care or private insurers, out-of-pocket costs, forgone earnings, or other losses to society associated with the two conditions.²⁷

CBO's primary analysis focused on VHA patients who had not been treated at specialized polytrauma facilities, which provide care for veterans who suffer from more than one complex physical or mental trauma. That analysis examined the use of VHA's health care services and cost of providing those services for 496,800 OCO veterans in four mutually exclusive groups:

- 103,500 patients with PTSD (but not TBI);
- 8,700 patients with TBI (but not PTSD);
- 26,600 patients with both PTSD and TBI; and
- 358,000 patients with neither of those two conditions.²⁸

Patients in the PTSD group did not have TBI, but many had other conditions; similarly, patients in the TBI group did not have PTSD, but many had other conditions. None of the groups includes 500 polytrauma patients, many with PTSD and TBI, who were analyzed separately. The data include 99 percent of all OCO veterans seen by VHA from 2004 to 2009. To protect patients' confidentiality, VHA did not provide CBO with data on individual

23. NwHIN is led by the Department of Health and Human Services. For more information, see http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__nhin_exchange/1407.

24. VHA did not provide CBO with data from the start of overseas contingency operations in 2001. However, the number of OCO veterans entering VHA before 2004 was relatively small: Roughly 10,000 veterans who deployed to Iraq and Afghanistan had sought VHA's health care services by the end of 2003.

25. Vet Centers provided PTSD services to 42,000 OCO veterans through June 2011; among those veterans, 27,000 were also seen for PTSD at a VHA medical center. The data that CBO analyzed do not include information on the 15,000 veterans seen only at Vet Centers.

26. In the information that it provided to CBO, VHA converted its cost data to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit from 2004 to 2009. CBO then indexed those costs to 2011 dollars using the implicit price deflator for gross domestic product.

27. Initial hospitalizations for the more severe cases of TBI are not included in VHA's costs because those individuals were still on active duty at the time of initial injury and would have been treated within DoD.

28. TBI describes an injury event, but the term TBI may also refer to symptoms that persist beyond the acute period. In this study, TBI patients are OCO veterans who, when examined at VHA facilities, exhibited symptoms attributed to a TBI.

patients. Because VHA did not identify the date of patients' first diagnosis or entry, CBO was not able to calculate the use or the cost of health care for patients entering VHA treatment in any given fiscal year.

For the first three groups, CBO presents data on the use of services and costs of treatment for the first year of care (treatment year 1) and for up to three additional years following initial diagnosis.²⁹ Data on patients with no diagnosis of PTSD or TBI are presented for comparison purposes following their initial visit for any VHA care. CBO did not receive detailed clinical data and thus was not able to construct a comparison group that was similar in all observed ways to the three groups apart from their diagnosis of PTSD, TBI, or both. The patients with and without PTSD or TBI were roughly similar in age, sex, and military experience, but they differed in certain characteristics, particularly injuries sustained while deployed in overseas contingency operations. In general, service members who had PTSD or TBI were more likely to have received other injuries, so the costs of care for the PTSD and TBI groups probably would have been higher even without the costs of care for PTSD and TBI. The poly-trauma group, which consisted of patients with multiple complex injuries requiring extended inpatient stays for rehabilitation at VHA, is examined separately later in the study; it was a very small group whose average medical costs were far higher than those of the four other groups.

CBO's analysis is based on data from VHA's administrative records from 2004 through 2009. Because some patients started using VHA's services partway through the sample period, not all patients were observed for the full six years. Indeed, CBO used only the first four years of data even when six years were available because data for that longer span existed for only a small minority of veterans. When fewer than four years of data existed, CBO

29. To determine the group to which a patient belonged, each OCO patient's administrative record was checked for any diagnosis code of PTSD or TBI, and the patient was assigned to the relevant group. Any patient with both codes was classified as having both PTSD and TBI. No patient could be included in more than one diagnosis group; once classified, patients remained in the same group for the entire sample period. The sample included all PTSD and TBI cases among OCO veterans diagnosed at VHA, regardless of whether those conditions were sustained while deployed. The share of veterans who acquired PTSD or TBI unrelated to deployment (for example, injury from an automobile accident after returning from Iraq or Afghanistan) is unknown but is probably a small portion of CBO's sample.

included all of the years available. Consequently, when CBO examined patients' first year of treatment, those who entered the VHA system in 2008 and 2009 were included, but when CBO examined later years of treatment, those patients were not included, having entered the system too late in the sample period.

Not only do patients entering VHA in 2008 and 2009 have fewer years of treatment data available, they are also different from those who entered in earlier years in two other ways. First, more veterans entering the VHA system in those later years had experienced longer deployments and multiple deployments. Second, starting in 2008, VHA extended enhanced eligibility from two years to five years for OCO veterans (see Box 1 on page 2). That extension enabled veterans with delayed-onset PTSD or other combat-related conditions for which they had not previously sought treatment to enter the VHA system and receive care at no cost. However, CBO does not believe that those two differences substantially affected the number or severity of PTSD or TBI cases or, more generally, the injuries or other medical conditions treated at VHA in 2008 and 2009.³⁰

While screening and treatment for PTSD were consistent across the years, VHA's clinical practices for TBI changed during the data period (2004 to 2009): The agency initiated comprehensive screening for mild, symptomatic TBI in 2007. As a consequence, the characteristics of TBI patients are likely to be different across treatment years. Patients whom VHA diagnosed with TBI before 2007 were more likely to have had moderate to severe TBI than those diagnosed in 2007 or after. The study period ended before the newly identified mild cases could accumulate four treatment years. Therefore, moderate and severe cases are more common among TBI patients in treatment years 3 and 4 than in treatment years 1 and 2. Because CBO did not have information on TBI severity (mild, moderate, or severe), it was not possible to separate the

30. Veterans who became part of CBO's sample in those later years are more likely to have remained in the military longer after deployment than those who entered in the early years of 2004 and 2005. Any health conditions that veterans who entered VHA in 2008 and 2009 developed during deployment, therefore, were more likely to have been treated by DoD before those service members transferred to VHA. The extension of enhanced eligibility in 2008 appears to have had a minimal effect on entry into the VHA system. VHA provided CBO with data showing that both before and after the policy change, most veterans who used VHA services did so within two years of separation from active duty.

use of services and costs by severity. The costs of treating mild TBI, however, are likely to be substantially lower than the costs of treating moderate and severe TBI. As a result of the policy change, use and costs in later treatment years grow for TBI patients and are almost as high in treatment year 4 as in treatment year 1. Without the policy change, use and costs for those patients probably would have been highest during the first year of care and then declined and stabilized thereafter, as occurred in the other groups.

VHA provided CBO with aggregate use and cost data for groups of OCO veterans based on their demographic characteristics, medical condition, and medical services used.³¹ Because data were provided at the group level, CBO can only present information on averages for those groups and not on the distribution of use or cost within groups. (For additional information about the data and methodology used in this analysis, see Appendix B.)

CBO calculated total and average costs for patients who accessed VHA's services at least once, for up to four years after their PTSD or TBI diagnoses or, in the absence of those diagnoses, average costs for up to four years after their entry into the VHA system. Diagnostic tests and pharmacy use were included and categorized as part of outpatient costs. As with all analyses based on administrative data, errors and nonstandardized coding may affect the results presented here.

Occurrence and Prevalence of PTSD and TBI

In the VHA data provided to CBO regarding 496,800 OCO veterans treated by VHA between 2004 and 2009, veterans with a diagnosis of PTSD (but not TBI) accounted for 21 percent (103,500) of the total, and those with a diagnosis of TBI (but not PTSD) accounted for 2 percent (8,700). In addition, veterans with diagnoses of both PTSD and TBI accounted for about 5 percent (26,600). Thus, three out of four OCO veterans with a

diagnosis of TBI had a concurrent PTSD diagnosis.³² In total, approximately 26 percent (130,100) had at least one diagnosis of PTSD, and 7 percent (35,300) had at least one diagnosis of TBI.³³ More than 70 percent (358,000) of OCO veterans treated by VHA were not diagnosed with either PTSD or TBI. Other mental health conditions besides PTSD are common within the OCO veteran population. (For a brief description of other mental health conditions and suicide in that population, see Box 2.)

The occurrence of PTSD and TBI among OCO veterans who use the VHA system—which is measured by the diagnosis rates just described—does not necessarily reflect the prevalence of those conditions in the entire OCO population. If service members who have separated from the military are more likely to have service-connected health problems than those who have remained on active duty, then the rate of diagnosis among VHA patients will be higher than the proportion of the entire OCO population that has those problems. If, however, sufficient numbers of veterans with PTSD or TBI were either being treated for the condition elsewhere or not being treated at all, the rate in the overall OCO population could be greater than the rate diagnosed among VHA patients. For example, some veterans have employment-based health insurance; others seek care from other sources that are not connected to their military service, perhaps because providers are located more conveniently or are perceived to be more private; and still other veterans forgo care altogether. For PTSD, the effect of stigma associated with a positive screening or diagnosis has not

31. VHA computes costs on the basis of its internal reporting systems. Costs for treating PTSD and TBI in the civilian population and veterans treated at VHA are unlikely to be comparable because of differences in cost allocation methodologies, the populations treated, and the mechanisms of injury. Also, while VHA data measure the costs of care, private-sector estimates are often based on insurance reimbursements to private providers, which are not identical to costs.

32. VHA researchers examining OCO veterans treated at VHA have reported rates of concurrent diagnoses that are similar to CBO's; however, some researchers drawing from broader samples of OCO service members and veterans find lower rates of concurrent TBI and PTSD. In the three studies with the largest sample sizes, between 33 percent and 39 percent of OCO veterans with mild TBI also screened positive for PTSD. See Kathleen F. Carlson and others, "Prevalence, Assessment, and Treatment of Mild Traumatic Brain Injury and Posttraumatic Stress Disorder: A Systematic Review of the Evidence," *Journal of Head Trauma Rehabilitation*, vol. 26, no. 2 (March–April 2011), pp. 103–115.

33. If the threshold is raised to include only veterans who had two or more visits coded with a diagnosis of PTSD or TBI, the rates that CBO estimates drop to 20 percent and 3 percent, respectively. (Some researchers consider a two-visit measure a more definitive indicator of a condition, although that more-stringent threshold will miss those veterans who have PTSD or TBI but leave the VHA system after the initial diagnosis.)

been measured well, but it is likely to reduce the number of people who admit to problems associated with PTSD and then screen positive. For those reasons, the prevalence—that is, the estimate of the proportion of cases in a population, whether or not the individual has received a clinical diagnosis from a medical professional—of PTSD and TBI in the OCO population probably differs from the percentage of patients in the VHA system diagnosed with those conditions.

Many researchers have estimated PTSD and TBI prevalence among different groups of service members and veterans who deployed to operations in Iraq and Afghanistan, but there is no consensus as to the prevalence rate among the entire OCO population.³⁴ Researchers generally have reported prevalence rates ranging between 5 percent and 25 percent for PTSD among different groups of service members who deployed to overseas contingency operations, with generally higher rates in studies of infantry brigades or combat teams. Researchers have found that the proportion of service members who experienced a TBI, including those who no longer had symptoms, ranged from 15 percent to 23 percent, and that the proportion of service members who had symptomatic TBI after returning from deployment ranged from 4 percent to 9 percent. Thus, the percentage of OCO veterans whom VHA clinicians have diagnosed with PTSD (26 percent) is at the top of the range of prevalence reported in published studies, whereas the percentage they have diagnosed with symptomatic TBI (7 percent) is in the middle of the reported range. The estimates of symptomatic TBI remain uncertain because there are no clinically validated diagnostic criteria for that condition, and connecting self-reported persistent symptoms to the initial injury is problematic. Published estimates of PTSD and TBI during deployment vary widely because the assessment tools used to identify the conditions, the criteria used to identify cases, and the subgroup of service members sampled differ among studies. (For a detailed discussion of those issues, see Appendix C.)

34. Those studies included papers that reported frequencies of possible cases of PTSD or TBI regardless of whether the objective of the study was to estimate the prevalence in the broader OCO population.

The gold standard for determining prevalence would be to evaluate each person in a representative sample of the OCO population using validated clinical interviews; achieving that ideal, however, would be expensive and difficult. Instead, some researchers use administrative data on diagnoses to measure the number of cases of PTSD and TBI; others use clinical screening tools to assess cases. Administrative data on diagnoses understate prevalence in a population because not everyone seeks care. Some researchers who use screening tools to identify PTSD and TBI apply low thresholds for assessing those conditions. In so doing, however, they may also generate many false positives and overestimate the number of cases. Conversely, researchers employing more restrictive thresholds could underestimate cases.

In addition, most studies to date, including some that attempt to be population-based, have oversampled certain groups; applying rates from nonrandom samples without the proper weighting is unlikely to yield an accurate measurement of prevalence. On the one hand, estimates based on combat units, which experience higher rates of physical and psychological trauma than other types of military units, may lead to prevalence estimates that are too high to apply to the general population of service personnel in a combat region, which includes support units. On the other hand, samples based on returning, uninjured troops may lead to estimated prevalence rates that are too low.

Another shortcoming with published studies, which applies also to diagnosis rates within VHA, is that service members and veterans may not accurately report their symptoms. The stigma associated with screening positive for PTSD, the perceived inconvenience of undergoing additional evaluation, or a lack of confidence in treatment effectiveness may lead to an underreporting of symptoms of mental health problems or TBI and thus an underestimate of prevalence.

Finally, using estimates of TBIs that occur during deployment is problematic because even a confirmed clinical diagnosis when or shortly after an injury is sustained does not reveal the frequency of persistent postconcussive symptoms. DoD reports that, although a small minority of service members has ongoing symptoms, most cases of TBI are mild, often resolving within weeks and almost always improving within three months.

Box 2.**Suicide and Mental Illness Among OCO Veterans**

Just over half of veterans of overseas contingency operations (OCO) treated by the Veterans Health Administration (VHA) have a diagnosis of a mental illness. Mental health problems can affect all aspects of life. Suicide among service members and veterans, an infrequent but devastating outcome of mental illness, is of particular concern to policymakers and others.

Suicide

In 2009, the suicide rate for military members serving on active duty was 18.3 per 100,000, the highest since 1980. The following year, that rate dropped to 17.0. In the general population, by comparison, the suicide rate in 2007 was 20.8 among males ages 20 to 24 and 20.7 among males ages 25 to 34.¹ From 2003 to 2010, the Department of Defense (DoD) confirmed nearly 2,000 suicides among active-duty service members, 300 of which occurred during deployment. Roughly 50 percent of suicides in 2010 occurred among military members who had deployed to overseas contingency operations. Suicide rates were higher in the Army and Marine Corps than in other branches of the military.

Suicides among service members who deployed to overseas contingency operations also occur after they leave military service. Studies of Vietnam veterans reveal that deployment to a war zone is associated with suicide in the years immediately following deployment.² However, information on suicides among veterans is less complete than it is for active-

duty personnel, and no nationwide surveillance system exists for tracking the incidence of suicides in that population.

The Centers for Disease Control and Prevention (CDC) compiles national statistics on suicide, but veteran status and the cause of death are not always reported correctly on death certificates or summarized accurately by local health officials. CDC estimates that about 35,000 suicides occurred in the U.S. population in 2007. A separate system, the CDC's National Violent Death Reporting System—which maintains more comprehensive data on violent deaths but operates in only a limited number of states—estimates that veterans accounted for 20 percent of the suicides in those states in 2005. The CDC and Department of Veterans Affairs have ongoing initiatives to tabulate all suicides among veterans.

Statistics from VHA's suicide-prevention coordinators indicate that in fiscal year 2009 there were nearly 11,000 suicide attempts among veterans receiving care from the agency; 6.2 percent were documented as fatal. Among VHA's patients in 2007, the rate of suicide was 35 per 100,000, a rate higher than that found in the general population. However, that rate is not adjusted for the demographics of VHA's user population. Veterans who use VHA, moreover, may do so because they have more medical conditions, including mental health conditions, than other veterans or members of the general population.

1. Historically, rates of death for all causes have been lower among service members than in the general population.

2. Institute of Medicine, *Gulf War and Health*, vol. 6, *Deployment-Related Stress and Health Outcomes* (Washington, D.C.: National Academies Press, 2007).

Continued

Use of VHA's Services

Through September 2011, VHA reported that the number of OCO veterans who had used VHA at least once totaled nearly 740,000, or 53 percent of OCO veterans. The OCO population using VHA's services tends to be male (88 percent), is young (46 percent are younger

than 32), consists predominantly of former soldiers in the Army (61 percent), and is slightly more likely to be veterans of active-duty units (56 percent) than reserve components.

Future spending on OCO patients will change according to the mix of conditions diagnosed and the number of

Box 2.**Continued****Suicide and Mental Illness Among OCO Veterans**

As part of VHA's expansion of mental health services, the agency's suicide-prevention program is wide-ranging.³ Initiatives include screening OCO veterans for selected mental health conditions; establishing suicide-prevention programs in each VHA hospital and large community-based outpatient clinic; operating a 24-hour suicide-prevention hotline staffed by VHA mental health professionals; and developing a system for flagging the records of patients at high risk of suicide.

Mental Illness

Among OCO veterans using VHA's services from October 2001 through June 2011, 21 percent were diagnosed with a depressive disorder. Other mental health conditions commonly diagnosed among OCO veterans are anxiety and drug or alcohol abuse. OCO patients with mental health conditions often have multiple conditions of this type.

Treatment for mental illness is provided at local facilities in broad consultation with VHA's Office of Mental Health Services, which has been implementing recommendations from its comprehensive five-year Mental Health Strategic Plan. That plan, which focused on gaps in mental health care for veterans, had several goals, which included addressing the mental health needs of OCO veterans and preventing suicide. One of the steps being taken to achieve those goals is to better integrate mental health treatment and primary care. For fiscal year 2010, VHA obligated \$5.2 billion for mental health programs—more than a tenth of its total spending

3. See the Joshua Omvig Veterans Suicide Prevention Act (P.L. 110-110, 38 U.S.C. 1720F).

for medical care; obligations are slated to exceed \$6 billion by 2012.⁴ Available services consist of outpatient specialty programs, inpatient psychiatric care, residential and vocational rehabilitation, substance use disorder care, and various local initiatives.

VHA provided CBO with information on the use of VHA's health care services and the costs of providing those services for 73,000 OCO veterans who had a mental health diagnosis other than PTSD (and no diagnosis of TBI). When compared with OCO veterans with no mental health diagnosis, patients with mental health disorders other than PTSD made greater use of VHA's health services in treatment year 1 as measured by inpatient hospital days (0.6 per year compared with 0.08 per year for veterans with no mental health diagnosis), annual outpatient visits (16 versus 8), and prescriptions filled (9 versus 3). When compared to OCO patients with PTSD, patients with other mental health conditions spent the same share (one-quarter) of their hospital days in psychiatric care but used less health care overall. For the first year of treatment, VHA spent \$350 million on patients with other mental health diagnoses. The average cost of care during the first year of treatment (\$4,300) was more than double that for OCO patients with no mental health diagnoses (\$2,000) but only half the average cost of treating OCO patients with PTSD.

4. An obligation is a commitment that creates a legal liability on the part of the government to pay for goods and services ordered or received. Such payments may be made immediately or in the future. Obligations during any year may exceed appropriations provided during that year because an agency may obligate funds that were provided in an earlier year.

patients treated.³⁵ CBO's estimates of diagnosis rates are useful in projecting VHA's future costs, but the usefulness

35. For a discussion of future spending on health care for OCO veterans, see Congressional Budget Office, *Potential Costs of Veterans' Health Care* (October 2010).

depends on the extent to which the prevalence of those conditions and veterans' likelihood to seek treatment at VHA remain the same. If outreach services motivate more veterans to seek care, for example, the rate at which veterans use VHA's services would tend to increase over time. Combat exposure should decline with OCO troop

levels, however, so fewer service members are likely to develop PTSD or TBI in the future. In addition, an increasing share of veterans who do seek care from VHA in the future will have deployed several years earlier and are more likely to have sought care through DoD or to have had their symptoms resolve than was the case for veterans who sought care from VHA before 2010. For those reasons, future veterans enrolling in VHA's health care system are less likely to seek treatment for PTSD or TBI.

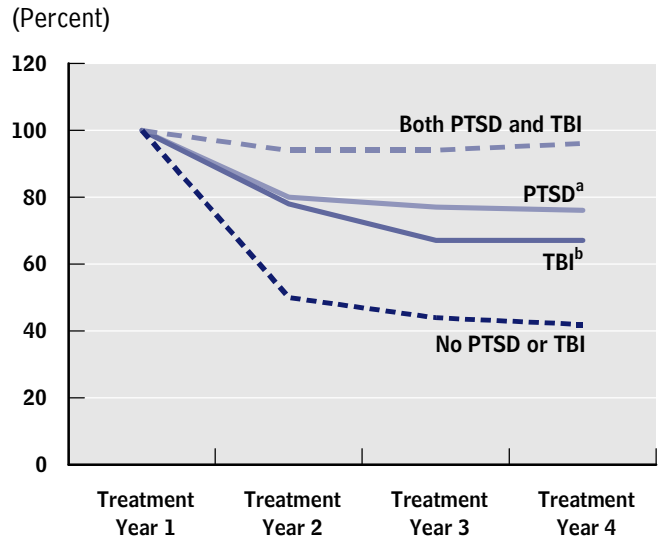
CBO measured the use of services by the number of patients who used VHA's services after a diagnosis of PTSD or TBI and by the frequency of their use after those diagnoses. CBO measured VHA's services in three categories: inpatient care (in days), outpatient care (in number of clinic visits), and pharmacy services (in 30-day equivalent prescriptions filled). CBO calculated the average use by service type in each treatment year for veterans who ever used VHA's services.

Patients who had PTSD, TBI, or both conditions used the VHA system much more in any given year and were more likely to use VHA's services than were patients with neither diagnosis. (This section of the analysis focuses on all health care services provided to patients in each group, regardless of whether a particular service was related to a PTSD or TBI diagnosis.) CBO found the highest average use of all health care services among patients who were treated for both PTSD and TBI. The use of services by TBI patients was roughly comparable to that of PTSD patients in the first two treatment years, but TBI patients (probably those with moderate to severe TBI) had markedly higher inpatient and outpatient use in treatment years 3 and 4. With the implementation of comprehensive screening for mild TBI in 2007, patients with moderate to severe TBI accounted for a larger share of cases in treatment years 3 and 4. Veterans with neither condition used VHA the least, with little change over the four treatment years. Use of services for most groups was highest in the first year of care.

Number of Patients Using VHA's Services

The share of veterans who continued to access care at VHA declined in the years following their initial use of its services; however, the rate of decline differed among the groups CBO analyzed. The largest decrease occurred in the group that had no diagnosis of either PTSD or TBI; less than half (42 percent) of those veterans continued to use VHA four years after initial use (see Figure 1).

Figure 1.
Continuation of Use of VHA's Services by OCO Veterans



Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: For treatment years 2 through 4, the share of patients treated by VHA represents the number of patients using VHA's services divided by the number of potential patients—those who were diagnosed with the condition in treatment year 1 and who remain in the sample (see Table D-1).

Data cover fiscal years 2004 to 2009 for up to the first four years of treatment. Data exclude about 500 patients, many with PTSD and TBI, who entered VHA at Polytrauma Rehabilitation Centers.

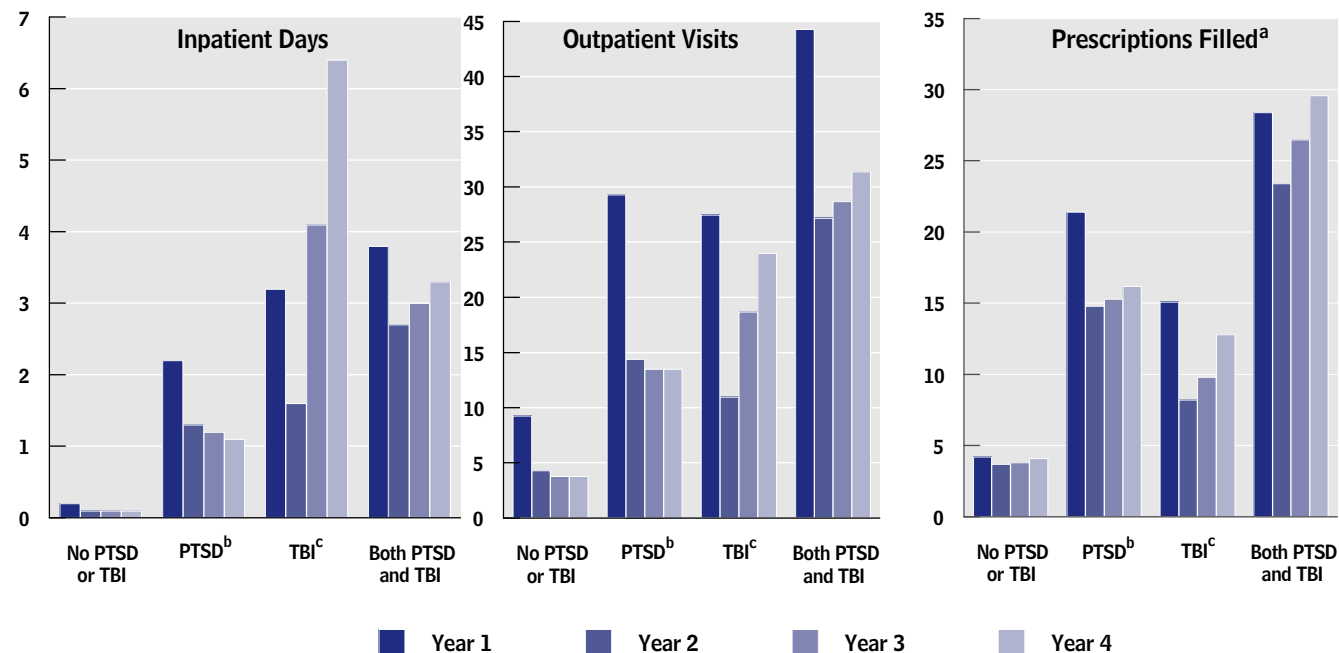
VHA = Veterans Health Administration; OCO = overseas contingency operations; PTSD = post-traumatic stress disorder; TBI = traumatic brain injury.

- a. Patients in the PTSD group did not have TBI, but many had other conditions.
- b. Patients in the TBI group did not have PTSD, but many had other conditions.

By contrast, at least two-thirds of veterans in the other three groups continued to use VHA for some of their health care four years after initial diagnosis. Those patients might have had more clinically complicated conditions that took longer to resolve. In addition, those patients' more intensive initial use of services might have predisposed them to continue pursuing care. Because of their conditions, moreover, some patients could also have had limited opportunities for employment, a common source of alternative health care options.

Figure 2.**Use of VHA's Health Care Services by OCO Patients**

(Average number)



Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for up to the first four years of treatment. Data exclude about 500 patients, many with PTSD and TBI, who entered VHA at Polytrauma Rehabilitation Centers.

Average annual use is based on the number of OCO patients who were ever seen at VHA, regardless of whether they were treated in a given year.

VHA = Veterans Health Administration; OCO = overseas contingency operations; PTSD = post-traumatic stress disorder; TBI = traumatic brain injury.

- "Prescriptions filled" includes all pharmacy services, such as dispensing of pharmaceuticals and over-the-counter drugs (measured in 30-day equivalents), as well as related supplies.
- Patients in the PTSD group did not have TBI, but many had other conditions.
- Patients in the TBI group did not have PTSD, but many had other conditions.

Frequency of Use

OCO veterans using any health care services at VHA at least once, for up to four years after diagnosis or entry into the system, were included in the calculations. Generally, OCO patients used VHA's services most intensively in the first year of treatment, after which use declined and stabilized (see Figure 2). The most notable exception was for patients with TBI (including those with both PTSD and TBI); their average use in each service category increased in treatment years 3 and 4. Patients who had neither a diagnosis of PTSD nor a diagnosis of TBI averaged many fewer inpatient days, outpatient visits, and

pharmacy prescriptions than members of the other groups.³⁶

Inpatient Care. Inpatient care for patients who had neither a PTSD nor a TBI diagnosis averaged less than one

36. Veterans enrolled in the VHA system usually have other sources of health care available to them and use VHA's services for a minority of their care. Because CBO has no data on OCO veterans' use of health care outside of VHA, it cannot determine differences in the total health care services used by the different groups. Consequently, OCO veterans with no diagnosis of PTSD or TBI may receive a higher or lower portion of their care from VHA than the other groups.

day in all of the years following their first visit.³⁷ The largest single category of inpatient care for this group in treatment year 1 was medical or surgical care (accounting for 41 percent). By contrast, the PTSD group averaged about two inpatient days in treatment year 1: 44 percent of those days were for residential rehabilitation (often treatment for mental health and substance abuse that focuses on community reintegration), and 27 percent were for psychiatric care. The TBI group averaged about three inpatient days in treatment year 1: 33 percent of those days were for rehabilitation medicine (treatment for physical impairments and disability), and 27 percent were for medical or surgical care. That distribution changed dramatically in the later years. The small number of TBI patients receiving VHA care in treatment year 4 (400 patients) were resource intensive: Inpatient hospital days for TBI patients doubled from about three in treatment year 1 to about six in treatment year 4. By treatment year 4, nursing home care, which was concentrated among fewer than 10 percent of TBI patients seeking care in that year, accounted for 82 percent of that group's inpatient days. The final group—those with both PTSD and TBI diagnoses—averaged nearly four inpatient days in year 1. Their inpatient use was most similar to that of the PTSD group, with 39 percent of inpatient days for residential rehabilitation and 21 percent for psychiatric care.

Outpatient Care. The PTSD group's use of outpatient care in treatment year 1 was more than three times as high (29 visits) as that of OCO veterans with neither PTSD nor TBI but fell by about half (to 14 visits) in the following year and then leveled off.³⁸ Although the TBI group had approximately the same number of outpatient clinic visits as the PTSD group in treatment years 1 and 2, the average number of visits for the TBI group rose again in treatment years 3 and 4. By treatment year 4, the

average number of visits for the TBI group (24 visits) was close to the number in the initial year of treatment (28 visits). Again, that pattern was most likely caused by the change in screening for TBI that led to more patients with mild TBI appearing in these data in earlier treatment years than later ones. Average use of outpatient care by the group with both PTSD and TBI diagnoses decreased sharply after treatment year 1 (from 44 visits to 27 visits in treatment year 2) and then rose a little thereafter.

In the first treatment year, one-quarter of the PTSD group's outpatient visits took place in mental health clinics, and an additional 8 percent of visits were in specialty PTSD clinics. For the group with TBI, 30 percent of outpatient care was provided in the aggregated, non-specific category of "other clinics" (which included rehabilitation clinics), and 28 percent was provided in diagnostic testing venues; less than 1 percent of their outpatient care was provided in TBI clinics. For the group with both PTSD and TBI, 22 percent of outpatient visits in treatment year 1 occurred in mental health clinics. Data provided to CBO for this study did not include sufficient information on individual clinical encounters to report the initiation or completion of a course of therapy.

Pharmacy Services. The group with neither a PTSD nor TBI diagnosis averaged four prescriptions annually in all treatment years.³⁹ The other groups had considerably more pharmacy services in the first year, from four to seven times as many as the group with no PTSD or TBI diagnosis. Although pharmacy services for the other three groups—those diagnosed with PTSD, TBI, or both—decreased between treatment years 1 and 2, that decline was reversed in later years. Indeed, the group of patients with both PTSD and TBI not only had more pharmacy services, on average, in treatment year 4 than in treatment year 1 but also had the highest average number of prescriptions (30 in treatment year 4).

Costs of VHA's Services

Costs generally followed the same patterns as use of services. Thus, the highest average costs were for patients treated for both TBI and PTSD. Average costs for all groups of OCO patients dropped in the second year of

37. Inpatient care includes medical or surgical care, rehabilitation medicine, residential rehabilitation, inpatient PTSD care, inpatient psychiatric care, PTSD residential rehabilitation, and nursing home care. Because only one or two categories of inpatient care generally accounted for a substantial share of treatment, only the largest categories are reported here.

38. Outpatient care includes care provided in various types of clinics: primary care, medical/surgical care, mental health, PTSD, TBI, polytrauma, and a more general type denoted as "other." Diagnostic tests are also included in outpatient care. Because only one or two categories of outpatient care typically accounted for a substantial share of treatment, only the largest categories are reported here.

39. The number of prescriptions filled includes the dispensing of pharmaceuticals and over-the-counter drugs (as measured in 30-day equivalents), as well as related supplies.

treatment and, for most groups, stabilized or declined thereafter. A notable exception was the group of patients treated for TBI; the average costs for those patients grew substantially in treatment years 3 and 4. That apparent anomaly most likely reflects the changing composition of the TBI group during the four-year treatment period. Because the data included veterans using VHA both before and after comprehensive TBI screening was implemented, patients with mild TBI probably accounted for a larger share of cases during the first two treatment years, and patients with moderate or severe TBI represented a greater share of cases during the latter two treatment years. Because VHA did not provide data that would enable CBO to separate mild cases of TBI from moderate or severe cases, CBO's ability to examine this issue further is limited.

CBO used two different approaches to analyze VHA's costs of treating veterans with PTSD, TBI, or both. The first method captures the total costs to VHA of treating those patients but overstates costs related solely to PTSD or TBI. The second method attempts to attribute costs for services directly to a diagnosis of PTSD or TBI, which yields costs that are lower than those estimated using the first method. However, the PTSD- and TBI-specific costs can be considered only rough approximations.

In the first approach, CBO calculated the total cost of all health care provided to OCO patients diagnosed with PTSD and TBI, regardless of whether that care was directly related to those conditions. If patients were treated for a back injury or hearing loss, for example, those treatment costs were included in CBO's estimates. All costs were included because determining which care is related to a specific condition requires subjective decisions. Furthermore, patients with PTSD or TBI frequently develop other conditions that may be caused or exacerbated by the presence of PTSD or TBI and thus may be considered additional, indirect costs of PTSD and TBI.

The second approach that CBO used to compute costs was to examine only PTSD- and TBI- specific care using the diagnostic codes identified by VHA's clinicians. Determining the cost of treating a particular condition (rather than the cost of treating a patient with the condition) requires subjective decisions that attribute a medical encounter and a specific portion of the cost of that encounter to a particular condition. Computing PTSD-

and TBI-specific costs, therefore, provides a rough estimate of how much VHA spends on treating those particular conditions. (See Appendix B for a description of CBO's methodology.)

Costs of All Health Care

In calculating total costs of all health care for patients with a particular diagnosis, CBO examined up to four years of data. CBO included all patients in the average cost calculations, whether those patients accessed VHA once or many times in the four years. (For an alternative method of examining average costs, see Appendix D.) Because the data are through 2009, patients that enrolled in 2007, 2008, and 2009 were not able to accumulate four years of treatment (see Appendix B).

Total Costs. During fiscal years 2004 through 2009, VHA spent \$3.7 billion for the first four years of treatment on the OCO patients analyzed by CBO.⁴⁰ CBO estimates that VHA spent 60 percent of that sum (\$2.2 billion) on patients with PTSD, TBI, or both. The group with neither a PTSD nor a TBI diagnosis—the largest group, with more than 350,000 patients—had the highest total costs: \$860 million in treatment year 1 and about \$1.5 billion in total costs from 2004 through 2009 (see Table 1). Total spending in those years for the PTSD patients was almost as high (\$1.4 billion), although the PTSD group had many fewer patients.

The share of total costs devoted to inpatient care varied by treatment group but was fairly stable over the first four years of treatment for all groups except TBI patients. For most groups, the share of total costs devoted to inpatient care was less than 25 percent. For TBI patients, however, the portion of total costs assigned to inpatient care was 40 percent in treatment year 1 and 50 percent in treatment year 4. A small percentage of TBI patients were responsible for those costs: Fewer than 10 percent of TBI patients in treatment year 4 used nursing home care, but at an average cost of approximately \$147,000 per nursing home patient.

40. See Appendix B for a description of CBO's methodology. VHA has reported the number of OCO patients and their associated costs in the various editions of the agency's annual budget documentation. VHA treated 508,000 OCO veterans from 2002 through 2009. The data that VHA supplied to CBO encompassed 98 percent of that population and, because some overhead costs were not included, about 92 percent of the total costs.

Table 1.**Total Costs for VHA's Health Care Provided to OCO Patients**

Treatment Group	Total Costs (Millions of dollars)	Total Costs Attributed to PTSD- and TBI-Specific Care (Millions of dollars)	Share of Total Costs Attributed to PTSD- and TBI-Specific Care (Percent)
PTSD or TBI			
PTSD ^a	1,420	660	46
TBI ^b	130	50	38
Both PTSD and TBI	670	380	57
All PTSD and TBI	2,220	1,090	49
No PTSD or TBI	1,450	0	0
All OCO Patients	3,670	1,090	30

Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for up to the first four years of treatment. Data exclude about 500 patients, many with PTSD and TBI, who entered VHA at Polytrauma Rehabilitation Centers.

VHA converted costs provided to CBO to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit from 2004 to 2009. CBO then indexed those costs to 2011 dollars using the implicit price deflator for gross domestic product.

VHA = Veterans Health Administration; OCO = overseas contingency operations; PTSD = post-traumatic stress disorder; TBI = traumatic brain injury.

- a. Patients in the PTSD group did not have TBI, but many had other conditions.
b. Patients in the TBI group did not have PTSD, but many had other conditions.

Average Costs. In treatment year 1, the average costs per patient diagnosed with PTSD (\$8,300), TBI (\$11,700), or both (\$13,800) were much higher than the average costs for those with neither PTSD nor TBI (\$2,400) (see Table 2 and Figure 3 on page 20).⁴¹ Although patients with PTSD, TBI, or both had higher average costs, those costs may not be solely attributable to those two conditions. If patients with PTSD or TBI have worse health overall (they may be more likely to have combat injuries, for example) than patients without those conditions, their costs will be higher. The group with both PTSD and TBI included patients with persistent symptoms from multiple conditions, which helps explain why their use of medical services and the costs of those services were greater than those for patients with PTSD or TBI alone.

For all groups, the average cost of all health care was highest in treatment year 1 (see Figure 3). For three of the four groups, costs largely stabilized or continued to drop

in the third and fourth treatment years. TBI patients were different. After dropping below the treatment year 1 level in years 2 and 3, costs rebounded to \$11,100 in treatment year 4. That pattern can be attributed to the composition of the TBI sample in later treatment years. As discussed earlier, the change in TBI screening implemented in 2007 means that the sample of patients analyzed here had a larger share with moderate or severe TBI in later treatment years.⁴² Thus, this result does not imply that new TBI patients will tend to require higher expenditures for treatment in later years.

Costs of PTSD- and TBI-Specific Care

To provide a rough estimate of how much VHA spent on treatment specific to PTSD and TBI, CBO also presents

41. By contrast, VHA projects that spending per veteran user for all eras will be an estimated \$9,100 in 2011.

42. In the data provided to CBO, TBI patients who used VHA's services for four years were diagnosed before 2007, when VHA began comprehensive screening of OCO veterans for mild TBI. Consequently, the portion of the sample drawn before 2007 was much smaller and probably included relatively more cases of moderate or severe TBI than later cohorts, making costs for patients with four treatment years unreliable in predicting future spending.

Table 2.**Average Costs for All of VHA's Health Care and VHA's PTSD- and TBI-Specific Care Provided to OCO Patients**

(Dollars)				
Treatment Group	Treatment Year 1	Treatment Year 2	Treatment Year 3	Treatment Year 4
Average Costs per Patient				
PTSD or TBI				
PTSD ^a	8,300	4,200	3,900	3,800
TBI ^b	11,700	4,600	7,300	11,100
Both PTSD and TBI	13,800	8,400	8,800	9,800
No PTSD or TBI	2,400	1,100	1,000	1,000
Average Costs per Patient for PTSD- and TBI-Specific Care				
PTSD	4,100	2,100	1,900	1,900
TBI	5,000	1,600	2,500	4,400
Both PTSD and TBI	8,000	4,900	5,300	5,700

Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for up to the first four years of treatment. Data exclude about 500 patients, many with PTSD and TBI, who entered VHA at Polytrauma Rehabilitation Centers.

Average annual costs are based on the number of OCO patients who were ever seen at VHA, regardless of whether they were treated in a given year.

VHA converted costs provided to CBO to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit from 2004 to 2009. CBO then indexed those costs to 2011 dollars using the implicit price deflator for gross domestic product.

VHA = Veterans Health Administration; PTSD = post-traumatic stress disorder; TBI = traumatic brain injury;

OCO = overseas contingency operations.

a. Patients in the PTSD group did not have TBI, but many had other conditions.

b. Patients in the TBI group did not have PTSD, but many had other conditions.

tabulations of the costs of care that had an accompanying diagnosis code of PTSD, TBI, or both. CBO reports two types of costs for patients in the years after diagnosis: total costs and average costs for PTSD- or TBI-specific care. The costs calculated using this method are lower than those presented earlier because they represent only a portion of health care costs for patients, not all costs.

Costs in this section should be considered a rough approximation of the costs of treating PTSD or TBI; they may be either too high or too low. When multiple diagnoses were made during an inpatient stay or outpatient visit that also included a PTSD or TBI diagnosis, VHA attributed all costs for that visit to PTSD or TBI. In addition, CBO attributed all costs for prescriptions and diagnostic tests to either PTSD or TBI for patients with those diagnoses (although VHA's clinical information systems do not associate diagnosis codes with those services).⁴³ That approach may overstate the costs to treat

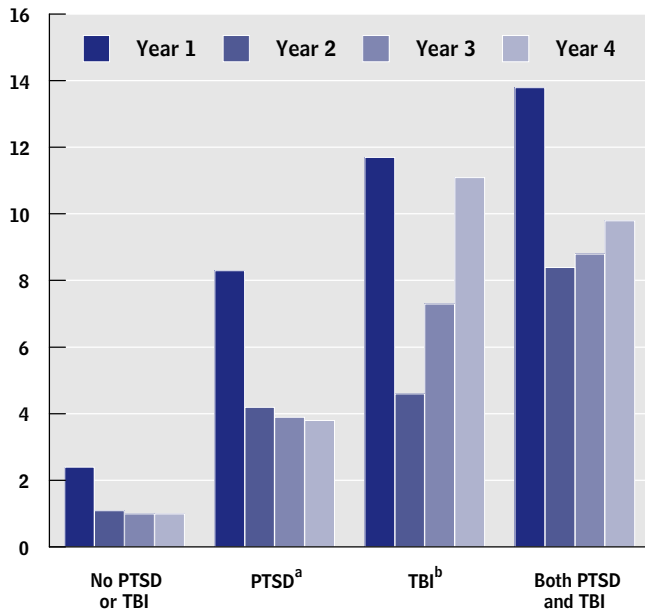
those conditions. Conversely, patients with PTSD and TBI often have other medical problems that may be related to their PTSD or TBI and that pose indirect costs not included; in such instances, the estimates may be too low. In addition, oversights on the part of care providers or medical coders may have resulted in missing PTSD or TBI diagnosis codes, which also could produce estimates that are too low.

Total Costs. While PTSD and TBI accounted for a sizable part of total health care costs, OCO veterans with PTSD or TBI also received a considerable amount of care for other conditions, even in the first year of treatment. VHA spent \$1.1 billion for PTSD- and TBI-specific care during the 2004–2009 period for the first four years of

43. If diagnostic and pharmacy costs were excluded, the average costs would be approximately 20 percent to 35 percent lower than reported here.

Figure 3.
Average Costs for All of VHA's Health Care Provided to OCO Patients

(Thousands of dollars)



Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for up to the first four years of treatment. Data exclude about 500 patients, many with PTSD and TBI, who entered VHA at Polytrauma Rehabilitation Centers.

Average annual costs are based on the number of OCO patients who were ever seen at VHA, regardless of whether they were treated in a given year.

VHA converted costs provided to CBO to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit from 2004 to 2009. CBO then indexed those costs to 2011 dollars using the implicit price deflator for gross domestic product.

VHA = Veterans Health Administration; OCO = overseas contingency operations; PTSD = post-traumatic stress disorder; TBI = traumatic brain injury.

- a. Patients in the PTSD group did not have TBI, but many had other conditions.
- b. Patients in the TBI group did not have PTSD, but many had other conditions.

treatment, with more than half of that amount spent on patients in their first year (see Table 1 on page 18). For the PTSD group, PTSD-specific care averaged almost half (46 percent) of total health care costs over four years. The share was somewhat less (38 percent) for TBI-specific care for the TBI group. More than half (57 percent) of the care provided to the group with both PTSD and TBI was directly related to those specific diagnoses.

Average Costs. CBO's estimates of average annual costs for treating PTSD or TBI or both in patients with those diagnoses can be regarded only as rough estimates because of the broad classification of treatments attributable to PTSD or TBI. Following the initial year of treatment for patients with PTSD, which cost \$4,100 per patient for PTSD-specific care, those costs fell by about half (see Table 2). Average costs of treating veterans with both PTSD- and TBI-specific care in year 1 (\$8,000 per patient) were almost double those for veterans with PTSD alone, and \$3,000 higher than the average costs of treating patients with TBI alone. Between treatment year 1 and treatment year 4, the average costs of care for PTSD and combined PTSD and TBI declined by 54 percent and 29 percent, respectively, but the average costs of TBI care decreased by only 12 percent during that period. As noted above, the pattern of costs for veterans with TBI is distorted by the change in screening during the sample period.

Other Studies of the Costs of Treating PTSD and TBI

CBO reviewed other studies on the costs of treating people with PTSD and TBI. CBO focused on studies examining those conditions in the OCO population, in part because costs experienced by the civilian population are unlikely to be comparable to those for the military population.⁴⁴ While studies of the costs to treat OCO veterans have been limited, more research is becoming available. CBO reviewed two studies of VHA costs, neither of which attempted to examine the costs of care related specifically to PTSD or TBI.

44. Reliable, up-to-date estimates of the total costs of PTSD and TBI are not available for the general population. In addition, cost estimates for civilians would not be comparable to those for the military partly because the mechanism of injury is different. Among OCO veterans, most TBIs are the result of explosions; military PTSD is typically related to combat.

One study compared the costs of treating OCO veterans with PTSD or TBI with the costs of treating OCO veterans without those conditions.⁴⁵ In fiscal year 2008, the average cost for patients with PTSD alone was between \$6,000 and \$8,000 (expressed in 2011 dollars), and the average cost for patients with TBI totaled about \$5,000. (TBI cases in that study were identified through VHA's screening and therefore were more likely to have been mild and less expensive to treat.) The corresponding cost for patients with both PTSD and TBI was \$10,300. For veterans with neither condition, the average cost was \$2,500, very similar to CBO's estimate for treatment year 1. Compared with CBO's estimates, most costs reported in the study for fiscal year 2008 are lower, but CBO's data contained a different mix of cases that included more severe ones.

A second study examined the average costs in fiscal year 2009 for VHA to treat OCO patients who had used any outpatient services in that year. The cost estimates, therefore, were for patients who first sought care in 2009, as well as those who had been treated for several years. The authors found that the median annual cost per patient with PTSD was \$2,800 (expressed in 2011 dollars); the mean was \$5,300. For patients with TBI, the median cost was \$3,400, and the mean was \$7,300. For veterans with both PTSD and TBI, the median cost was \$7,300, and the mean was \$12,300.⁴⁶ Those average values for fiscal year 2009 are all lower than CBO's estimates of all health care costs for such patients for the first treatment year.

Another study, by the RAND Corporation, examined costs of treating service members who deployed to overseas contingency operations, but its focus on societal costs makes it dissimilar to CBO's analysis of VHA's costs.⁴⁷

45. Ann Hendricks and others, "Screening for Mild Traumatic Brain Injury in OEF/OIF Deployed Military: An Empirical Assessment of the VHA Experience," (paper presented at the National Conference of VA's Health Services Research and Development Service, Washington, D.C., February 16–18, 2011).

46. Brent Taylor and others, "Prevalence and Costs of Co-Occurring TBI, Psychiatric Disturbance, and Pain Among OEF/OEF VA Users," (paper presented at the National Conference of VA's Health Services Research and Development Service, Washington, D.C., February 16–18, 2011).

Polytrauma Patients

Polytrauma patients at VHA are those with multiple severe injuries. Patients categorized as polytrauma for purposes of this analysis first enrolled in the VHA system as inpatients at one of the Polytrauma Rehabilitation Centers; about 500 OCO veterans were identified as polytrauma patients. Some patients with multiple traumas were included in other groups in CBO's analysis, however, because their first encounters with VHA were not at a Polytrauma Rehabilitation Center, but rather at some other facility.

After initial entry into the polytrauma system, those patients continued to access VHA's health care system. In any given treatment year, at least 95 percent used VHA and had some PTSD- and TBI-specific care. Like patients in the other groups, polytrauma patients used significantly more resources in treatment year 1 than in later years (see Table 3). The average hospital stay in treatment year 1 was close to two months, with 73 percent of that care delivered in rehabilitation medicine. In subsequent years, the average annual length of an inpatient stay declined dramatically. Outpatient clinic visits for polytrauma patients were close to half the initial

47. In RAND's *Invisible Wounds of War*, researchers estimated the 2005 societal costs, including the costs from unemployment and suicide, of treating service members who deployed to overseas contingency operations. The researchers found that the costs of PTSD ranged from \$5,900 to \$10,300 for two years. Using Medicare reimbursement rates and other data, the researchers reported that the societal costs of TBI for one year ranged from \$26,000 to \$31,000 for mild cases and from \$252,000 to \$383,000 for moderate and severe cases. Because the data undercounted the number of mild TBIs and overcounted the number of hospitalizations attributable to those mild cases, the reported costs for mild TBI are likely to be substantially overstated. RAND's estimates of societal costs should not be compared with CBO's numbers, which focus only on VHA's costs. (Unlike RAND's estimates, CBO's estimates of the costs of treating TBI exclude the initial hospitalizations of the more severe cases because those individuals were still on active duty at the time of initial injury and hospitalization and therefore would have been treated within DoD.) See Terri Tanielian and Lisa H. Jaycox, eds., *Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery* (Santa Monica, Calif.: RAND Corporation, 2008).

Table 3.

Use and Costs of VHA's Health Care Provided to OCO Polytrauma Patients

	Treatment Year 1	Treatment Year 2	Treatment Year 3	Treatment Year 4
Average Use per Patient				
Inpatient Days	56	17	8	11
Outpatient Visits	77	66	60	43
Prescriptions Filled ^a	45	29	31	33
Average Costs per Patient (Dollars)				
Health Care	136,000	42,000	27,000	28,000

Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for up to the first four years of treatment.

Average annual use and costs are based on the number of OCO patients who were ever seen at VHA, regardless of whether they were treated in a given year.

VHA converted costs provided to CBO to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit from 2004 to 2009. CBO then indexed those costs to 2011 dollars using the implicit price deflator for gross domestic product.

VHA = Veterans Health Administration; OCO = overseas contingency operations.

- a. "Prescriptions filled" includes all pharmacy services, such as the dispensing of pharmaceuticals and over-the-counter drugs (measured in 30-day equivalents), as well as related supplies.

number by treatment year 4. Pharmacy use declined 36 percent in treatment year 2, but as with other groups analyzed in this study, increased thereafter.

The pattern of use was reflected in the costs of treatment. The average cost of all health care per polytrauma patient in treatment year 1 was \$136,000, or nearly 10 times the average cost for the group with both PTSD and TBI. Average annual health care costs dropped to about 30 percent of their first-year amount in treatment year 2 and to about 20 percent of that amount by year 4. PTSD- and TBI-specific care accounted for 60 percent

(\$55 million) of total health care costs for polytrauma patients during the 2004–2009 period, a percentage similar to that for the group with both PTSD and TBI.⁴⁸ In total, health care costs for the roughly 500 polytrauma patients treated between 2004 and 2009 exceeded \$91 million.

48. Because polytrauma patients have many other medical conditions, it is difficult to attribute a portion of their total costs of care specifically to PTSD and TBI. The relatively high average costs credited to PTSD- and TBI-specific care is probably an artifact of how such costs are allocated. See Appendix B.



Appendix A: Background on PTSD and TBI

Post-traumatic stress disorder (PTSD) is an anxiety disorder induced by exposure to a traumatic event. Although the psychological effects of combat have long been recognized (in previous wars, the symptoms now associated with PTSD were known as “shell shock” or “battle fatigue”), the American Psychiatric Association did not codify PTSD as a separate mental disorder until 1980. Traumatic brain injuries (TBIs) are defined as a blow, jolt, or penetrating injury to the head that interrupts the functioning of the brain, at least momentarily. Medical intervention varies considerably. During military combat operations, some mild TBIs may go untreated when there are no physical head wounds or neurological signs of impairment. Medical personnel may not detect injury, especially when more obvious, life-threatening injuries require attention, and service members may not seek care for a TBI if the injury does not appear acute. Moderate and severe TBIs, however, are generally apparent clinically through changes in consciousness or neurological impairment.

Criteria for a PTSD Diagnosis

According to current diagnostic criteria for PTSD, a person must experience a traumatic event—involving death or serious injury, or a threat to the physical integrity of self or others—and react to the trauma with intense horror, fear, or helplessness.¹ Sometime after that trauma, the person must also develop symptoms that cause clinically significant distress or impairment lasting for more than one month. Those symptoms must be from each of the following three symptom clusters:

- Reexperiencing the traumatic event, such as having recurring and distressing recollections or nightmares;
- Avoidance of stimuli associated with the trauma, such as thoughts, feelings, and conversations, along with diminished responsiveness and loss of interest in activities; and
- Hyperarousal, such as irritability, anger, hypervigilance, insomnia, or difficulty with concentration.

For example, a person who experienced nightmares about the trauma and had lost interest in daily activities but had no symptoms of hyperarousal would not have PTSD, according to those diagnostic criteria.

There are various forms of PTSD. Acute PTSD occurs when the duration of symptoms is between one and three months. Patients with symptoms extending for more than three months are considered to have chronic PTSD. Delayed-onset PTSD occurs when symptoms begin at least six months after the trauma.

1. For more detail, see the *Diagnostic and Statistical Manual of Mental Disorders* (DSM), 4th ed., rev. (Arlington, Va.: American Psychiatric Publishing, 2000). In previous editions, the DSM required that the trauma be outside the range of usual human experience but set no requirement for impairment. More recently, according to the committee revising the DSM, the requirement that the trauma result in horror, fear, or helplessness may be eliminated in the 5th edition of the DSM, scheduled for release in 2013.

Course of PTSD

Among people who develop PTSD, the symptoms and their intensity may differ over the course of the disorder.² Some people recover without medical intervention; others experience chronic symptoms persisting for years, even decades; and still others have sporadic symptoms. For most people who develop PTSD, symptoms appear soon after the trauma, although the time between exposure and symptoms sufficient for a clinical diagnosis of PTSD varies.

Studies of Vietnam veterans who developed PTSD have found that, for most veterans, the onset of PTSD occurred during the first few years following combat trauma, with the number of symptoms increasing rapidly during that period. A study by Schnurr reported that more than 60 percent of Vietnam veterans who developed PTSD did so less than two years after entry into the combat theater; fewer than 10 percent experienced an onset of PTSD more than six years after entering the combat theater.

Researchers have found that a substantial portion of PTSD patients develop chronic PTSD. Two studies—one by Breslau and one by Kessler and others—indicate that, for 20 percent to 40 percent of PTSD cases, symptoms abate within one year. According to Kessler and others, as well as Conner and Butterfield, symptoms do not

improve substantially in more than one-third of PTSD cases even after several years. (Because the populations, treatment, and timing of treatment in those studies differ from those in CBO's analysis, the rates of remission reported in the studies may not be applicable to more recent combat veterans.)

Risk and protective factors for experiencing PTSD and for subsequent recovery include demographic characteristics, socioeconomic status, psychiatric history, and social support. Among Vietnam veterans, women were more likely than men to develop PTSD. Research also shows that lower educational attainment, lower income, and minority status place individuals at greater risk.³ The presence of social networks and social support after a stressor serves to protect against PTSD, particularly for combat veterans. Finally, more frequent and intense exposure to combat is strongly associated with the development of PTSD.

Clinical Definition of TBI

The Centers for Disease Control and Prevention defines TBI as an injury to the head arising from blunt or penetrating trauma or from acceleration-deceleration forces that result in one or more of the following:

- decreased level of consciousness;
- amnesia regarding the event itself or events preceding or following the injury;
- skull fracture;
- a neurological or neuropsychological abnormality such as disorientation, agitation, or confusion; or
- an intracranial lesion such as a traumatic intracranial hematoma, cerebral contusion, or penetrating injury.⁴

Neurologists classify the severity of the TBI at the time of the injury as mild, moderate, or severe. Mild TBIs

2. Information for this section was compiled from the following sources: Institute of Medicine, *Gulf War and Health*, vol. 6, *Physiologic, Psychologic, and Psychosocial Effects of Deployment-Related Stress* (Washington, D.C.: National Academies Press, 2008); J.D. Bremner and others, "Chronic PTSD in Vietnam Combat Veterans: Course of Illness and Substance Abuse," *American Journal of Psychiatry*, vol. 153, no. 3 (1996), pp. 369–375; Naomi Breslau and others, "Trauma and Posttraumatic Stress Disorder in the Community," *Archives of General Psychiatry*, vol. 55, (July 1998), pp. 626–632; Naomi Breslau, "Outcomes of Posttraumatic Stress Disorder," *Journal of Clinical Psychiatry*, vol. 62, supplement 17 (2001), pp. 55–59; Ronald C. Kessler and others, "Posttraumatic Stress Disorder in the National Comorbidity Survey," *Archives of General Psychiatry*, vol. 52 (December 1995), pp. 1048–1060; Kathryn M. Connor and Marian I. Butterfield, "Posttraumatic Stress Disorder," *Focus*, vol. 1, no. 3 (Summer 2003), pp. 247–261; and Paula P. Schnurr and others, "A Descriptive Analysis of PTSD Chronicity in Vietnam Veterans," *Journal of Traumatic Stress*, vol. 16, no. 6 (December 2003), pp. 545–553; Karestan C. Koenen and others, "Risk Factors for Course of Posttraumatic Stress Disorder Among Vietnam Veterans: A 14-Year Follow-Up of American Legionnaires," *Journal of Consulting and Clinical Psychology*, vol. 71, no. 6 (2003), pp. 980–986.

3. For a more detailed discussion about risk and protective factors, see Institute of Medicine, *Gulf War and Health*, vol. 6, *Physiologic, Psychologic, and Psychosocial Effects of Deployment-Related Stress*.

4. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, *Traumatic Brain Injury in the United States: A Report to Congress* (December 1999).

account for the vast majority of such injuries. Definitions of mild TBI, also known as a concussion, vary within the neurology community, but a generally accepted definition from the American Congress of Rehabilitation Medicine specifies at least one of the following symptoms after a blow to the head:

- Loss of consciousness for no more than 30 minutes;
- Loss of memory, lasting no longer than 24 hours, of events immediately before (retrograde amnesia) or after (posttraumatic amnesia) the injury;
- Any alteration in mental state (being dazed, disoriented, or confused, for example) at the time of the injury; or
- A score of 13 to 15 on a Glasgow coma scale (an assessment of neurological functioning).⁵

Injuries above any of those thresholds are moderate to severe TBIs. The continuation of multiple symptoms may be labeled as postconcussional disorder or postconcussive syndrome (PCS); however, those terms are problematic because there is no single clinically validated definition of the condition.⁶ Short- or long-term impairment may affect memory, reasoning and problem solving, language, speech, motor skills, physical functions, and psychosocial behavior.

Course of TBI

Although the effects of, and recovery from, TBI differ among individuals, impairment tends to be greater for those with moderate or severe TBIs than for those with mild TBIs. Moderate and severe TBIs are usually associated with damage to the brain that can be detected when

5. T. Kay and others, "Definition of Mild Traumatic Brain Injury," *Journal of Head Trauma Rehabilitation*, vol. 8, no. 3 (September 1993), pp. 86–87. Criteria by the Department of Veterans Affairs and the Department of Defense for severity are largely consistent with the above guidance, although they have one additional criterion for mild TBI: Brain imaging results must be normal. Service members who meet the other criteria for mild TBI but have abnormal brain imaging results are rated as having moderate TBIs. Service members who meet the criteria for more than one severity level are rated at the higher severity. See Department of Veterans Affairs and Department of Defense, *VA/DOD Clinical Practice Guideline for Management of Concussion/Mild Traumatic Brain Injury*, April 2009.

imaged.⁷ For people with moderate or severe TBI, injuries to the brain—swelling of brain tissue, insufficient blood flow, and pressure within the skull, for example—may require surgery or medication. Recovery from moderate or severe TBI ranges from full rehabilitation to significant disability. Survivors of moderate or severe TBI may suffer lasting consequences such as seizures, nerve damage, behavioral abnormalities, and cognitive and language difficulties.

Research findings on the course of recovery after mild TBI vary widely, partly because of the difficulty in making causal associations between the initial injury and physical or cognitive problems following the injury.⁸ Frequently reported problems following a mild TBI include headache, fatigue, dizziness, depression, and difficulties with memory and concentration. However, many problems associated with mild TBIs are nonspecific or common to many conditions and widely experienced by

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6. The DSM-IV and ICD-10 (*International Classification of Diseases*, 10th ed.) define the condition differently, which often results in diagnostic disagreement. In addition, controversy surrounds the diagnosis of the condition—specifically, whether symptoms that occur after an injury can be unequivocally attributed to mild TBI, as opposed to other conditions. See Corwin Boake and others, "Diagnostic Criteria for Postconcussional Syndrome After Mild to Moderate Traumatic Brain Injury," *Journal of Neuropsychiatry and Clinical Neuroscience*, vol. 17, no. 3 (Summer 2005), pp. 350–356; and Linda J. Carroll and others, "Methodological Issues and Research Recommendations for Mild Traumatic Brain Injury: The WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury," *Journal of Rehabilitation Medicine*, vol. 36, supplement 43 (February 2004), pp. 113–125. The Department of Veterans Affairs and the Department of Defense's clinical guidelines for diagnosing and treating mild TBI do not endorse either the DSM's or ICD's definition of PCS.
7. For more information on the effects of TBI, see Institute of Medicine, *Gulf War and Health*, vol. 7, *Long-Term Consequences of Traumatic Brain Injury* (National Academies Press: Washington, D.C., 2008).
8. See Linda J. Carroll and others, "Prognosis for Mild Traumatic Brain Injury: Results of the WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury," *Journal of Rehabilitation Medicine*, vol. 36, supplement 43 (February 2004), pp. 84–105; Heather G. Belanger and others, "The Veterans Health Administration System of Care for Mild Traumatic Brain Injury: Costs, Benefits, and Controversies," *Journal of Head Trauma Rehabilitation*, vol. 24, no. 1 (January–February 2009), pp. 4–13; Charles Hoge and others, "Care of War Veterans with Mild Traumatic Brain Injury—Flawed Perspectives," *New England Journal of Medicine*, vol. 360 (April 16, 2009), pp. 1588–1591.

the general population. Consequently, there is no objective way of determining whether ongoing problems are caused by an earlier mild TBI or arise from other conditions.

Most people with mild TBI report one or more symptoms or problems immediately after the injury; however, medical evidence suggests that recovery typically occurs within a matter of weeks or months, with improvement most pronounced in the first months.⁹ In addition, some studies indicate that between 5 percent and 20 percent of people who experience a mild TBI remain symptomatic after 12 months, although some researchers have reported rates that exceed 20 percent, and others have argued that rates are at the lower end of the range at most.¹⁰ Generally, studies report that a small subset of patients experience one or more symptoms or limitations for years after the injury. Repeated incidents of mild TBI (as may

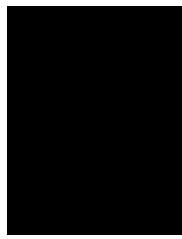
occur from wartime explosions or in contact sports such as football or hockey) may lead to more significant long-term health problems.

Several studies have attempted to identify preinjury and postinjury factors that may alter the course of recovery from mild TBI.¹¹ Researchers have found that the severity and duration of symptoms can be reduced by providing reassurance to patients and by providing education to patients on both the course of TBI and expected recovery from the condition. Few other factors have consistently been shown to facilitate recovery from mild, symptomatic TBI.

9. See Carroll and others, "Prognosis for Mild Traumatic Brain Injury"; Michael P. Alexander, "Mild Traumatic Brain Injury: Pathophysiology, Natural History, and Clinical Management," *Neurology*, vol. 45, no. 7 (July 1995), pp. 1253–1260; and Thomas W. McAllister, "Mild Brain Injury and the Post-concussion Syndrome," in Jonathan M. Silver, Thomas W. McAllister, and Stuart C. Yudofsky, eds., *Textbook of Traumatic Brain Injury* (Arlington, Va.: American Psychiatric Publishing, 2004), pp. 279–309.

10. See Michael A. McCrea, *Mild Traumatic Brain Injury and Postconcussion Syndrome: The New Evidence Base for Diagnosis and Treatment* (New York: Oxford University Press, 2008); Alexander, "Mild Traumatic Brain Injury," pp. 1253–1260; Heather G. Belanger and others, "Factors Moderating Neuropsychological Outcomes Following Mild Traumatic Brain Injury: A Meta-Analysis," *Journal of the International Neuropsychological Society*, vol. 11, no. 3 (2005), pp. 215–227; and Grant L. Iverson, "Outcome from Mild Traumatic Brain Injury," *Current Opinion in Psychiatry*, vol. 18, no. 3 (May 2005), pp. 301–317.

11. See Heather Belanger and others, "The Veterans Health Administration System of Care for Mild Traumatic Brain Injury: Costs, Benefits, and Controversies"; also see Carroll and others, "Prognosis for Mild Traumatic Brain Injury."



Appendix B: Data and Methods

The Veterans Health Administration (VHA) provided the Congressional Budget Office (CBO) with information on the frequency and costs of various health care services for veterans of overseas contingency operations (OCO) for fiscal years 2004 through 2009. VHA identified patients using a roster of OCO veterans that was derived from the Department of Defense's (DoD's) list of separated service members eligible for VHA benefits. The roster is based on a combination of pay and operational records and contains data fields describing both general demographic characteristics and military service information such as branch, rank, and deployment dates.

VHA data included virtually all OCO veterans seen at VHA during fiscal years 2004 to 2009; fewer than 1 percent of patients were deleted from the data set because their information was incomplete. VHA provided the data to CBO in groups organized by sex, age interval, year of treatment, clinical service use, and clinical diagnoses. The diagnosis groups were defined to be mutually exclusive, so that no patient was included in more than one diagnosis group during the first year of treatment at VHA; once classified, patients remained in the same group for the entire sample period. A patient was identified as having post-traumatic stress disorder (PTSD) or a traumatic brain injury (TBI) if he or she had at least one medical encounter with VHA in which PTSD or TBI was listed as a primary or secondary diagnosis. The identification of PTSD and TBI was broad, in that not all patients with those diagnoses sustained those conditions while deployed and, even among those who did sustain the conditions while deployed, the conditions were not necessarily related to combat. Patients who did not receive a diagnosis of PTSD or TBI were also followed

from their first visit to VHA. From the time of the initial clinic visit or inpatient stay, all patients were followed in 12-month increments. Service use and costs were aggregated into totals by year of treatment.

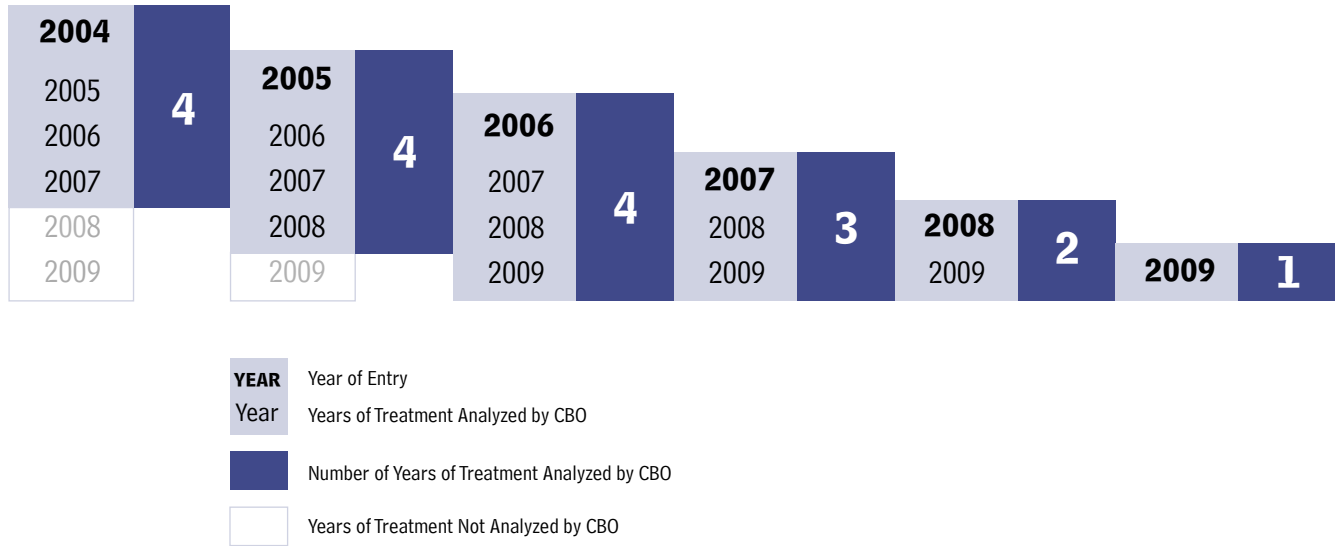
CBO subsequently combined all patients into four mutually exclusive cohorts: no documented diagnosis of PTSD or TBI, a diagnosis of PTSD and not TBI, a diagnosis of TBI and not PTSD, or diagnoses of both PTSD and TBI.¹ Polytrauma patients were analyzed separately as a fifth group because their usage was greater and their costs substantially higher than those of other OCO patients. Small cohort size was an issue in later treatment years: CBO restricted its analysis to the first four years of treatment for each entry group. As overseas contingency operations have continued, increasing numbers of service members have deployed and separated from the military and become eligible for VHA care; therefore, many patients in CBO's analysis entered the VHA system in the last two years of the sample period (2008 and 2009), and data accrued for them only for treatment years 1 or 2 (see Figure B-1). Consequently, each group had fewer patients in treatment year 4 than in treatment year 1. Because CBO did not have data at the patient level, only group totals and weighted averages were calculated. The lack of patient-level data made it impossible to separate groups by the year in which patients first used VHA's services, preventing CBO from following groups of patients during the specific fiscal years in which they were treated.

VHA extracted data on patients' use of services mainly from its National Patient Care Database, which includes

1. Because of small sample sizes for female veterans and some age groups, CBO does not report analyses along those dimensions.

Figure B-1.

Years of Potential Use of VHA's Services, by OCO Patient's Year of Entry



Source: Congressional Budget Office.

Notes: VHA = Veterans Health Administration; OCO = overseas contingency operations.

information on patients from all of its clinical information systems. Information on the use of various medical services was available for 16 detailed categories, not all of which were well populated. To provide a general overview, CBO classified the use of services as inpatient, outpatient, or outpatient pharmacy. Use was measured in days of inpatient hospital care and outpatient clinic visits. A veteran may have had several outpatient visits on a single day, each tallied separately. Pharmacy services were measured as the number of 30-day equivalent prescriptions filled.

The primary source of the cost data provided to CBO was the cost-accounting system of VHA's Decision Support Service (DSS); a second source, the Fee Basis database, included the cost of outside care paid for by VHA. VHA combined those separate sources of cost data, which captured most of the costs of services covered by VHA, into unified data for CBO. Costs reflected medical center-specific expenditures. Approximately 8 percent of total costs were not included, such as those for capital, depreciation, the central office of the Department of Veterans Affairs (VA), and some national programs. Because of those exclusions, the data used by CBO were slightly different from the DSS data available

to most VHA researchers; therefore, other researchers may not be able to reproduce the same results precisely.

The DSS system takes clinical and financial information from other VHA databases and uses algorithms that merge data and allocate costs across functional units. Cost estimates of individual health care encounters are also produced. Those costs include both direct and indirect (overhead) components. Because the accuracy of those costs depends on the quality of the feeder databases, DSS data are subject to auditing at regular intervals. DSS data are longitudinal and retrospective. VHA uses DSS information extensively, including for the purpose of financial allocation, and considers the data to be highly reliable.

DSS computations to derive patient-level costs require several steps. First, cost data from VHA's core financial and payroll systems are fed into DSS. Those cost data reflect VHA's actual outlays for salaries, supplies, and contract services, as well as imputed costs for depreciation. At that level, expenditures are differentiated by type of expense (labor category or supplies and equipment) and by administrative service (nursing or laboratory tests). Next, DSS assigns costs to functional cost centers that involve either the direct provision of health care or

indirect support for health care. Cost centers that provide care directly include primary care clinics and psychiatric wards, whereas cost centers that provide indirect support for health care include information technology support and security. Using a standardized methodology, those indirect costs are then allocated to departments providing care directly within each facility. After all costs have been assigned by function, unit costs for intermediate products are constructed. Intermediate products are goods and services used in providing care, such as blood draws, laboratory tests, or doctors' time during primary care visits. Finally, all intermediate products and their prices are assigned to individual patients to estimate the cost of health care encounters.²

CBO categorized cost data as inpatient and outpatient, with outpatient pharmacy costs included in the outpatient category. VHA converted the costs provided to CBO to fiscal year 2009 dollars on the basis of annual increases in the average cost of a primary care visit between fiscal years 2004 and 2009. CBO then indexed those costs to 2011 dollars using the implicit price deflator for gross domestic product.

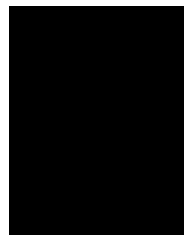
Using those data, CBO calculated average costs per patient with PTSD or TBI, or both, of health care services for each treatment year by dividing costs in that year (the numerator) by the number of patients who had ever

been diagnosed for PTSD or TBI and remained in the sample that year (the denominator). Average costs for those without PTSD or TBI were calculated using a similar method. Patients who used care from VHA for only a single year or a single time were included in the denominator for all subsequent years, even years for which they had no costs. In other words, CBO counted the entire population of veterans diagnosed with PTSD or TBI regardless of whether they continued to use VHA's services after their first visit. That approach shows VHA's average cost per patient to treat the entire population of veterans in each diagnosis group (those diagnosed with PTSD, TBI, both, or neither).

In calculating the average costs of PTSD- and TBI-specific care, CBO used a similar methodology. VHA provided two additional cost categories: "all PTSD care" and "all TBI care," which were used as the numerator. The tallies of those categories should be viewed as rough approximations of the costs of treating PTSD and TBI. VHA assigned all costs associated with a medical encounter (for example, an inpatient stay or outpatient visit) as "PTSD care" or "TBI care" whenever there was a primary or secondary diagnosis of either condition. For the group with both PTSD and TBI, if an encounter had both diagnosis codes, all the costs for that encounter were counted in both categories—that is, they were assigned to the costs of "PTSD care" and also to those of "TBI care"—so estimates of dollars spent for the treatment of PTSD and TBI are not mutually exclusive. For all groups, the total cost of an entire visit was attributed to PTSD or TBI (or both) even if there were several other diagnoses.

CBO used VHA's "all PTSD care" and "all TBI care" cost categories and, in addition, attributed the costs of diagnostic tests and pharmacy use, to which VHA does not assign diagnosis codes, to PTSD or TBI care, according to the group to which patients had been assigned. Inclusion of diagnostic tests and pharmacy services increased the costs for the subtotals for "all PTSD care" and "all TBI care" by between 20 percent and 35 percent.

2. Although some researchers have used Medicare reimbursement data to estimate health care costs, those data would not have been useful for CBO's analysis, which focuses solely on VHA's costs. VHA's costs and Medicare reimbursement rates are structurally different and therefore not directly comparable. As a health insurance system, Medicare reimburses providers on the basis of a price schedule for various services classified by diagnosis codes; negotiated prices presumably reflect the providers' costs, but they are not equal to those costs. By contrast, VHA is a direct health care provider with an accounting system designed to measure the direct and indirect costs of each health care encounter. In addition, services are not necessarily comparable. For example, VHA hospital stays include the costs of services provided by physicians; by contrast, Medicare's reimbursements to hospitals for inpatient stays do not.



Appendix C: Interpreting Published Estimates of the Prevalence of PTSD and TBI

Prevalence estimates for post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI) vary substantially. Changes in diagnostic criteria over time, as well as differences in the populations studied, diagnostic tools used to identify cases, and the methodologies employed all contribute to that variation.

PTSD Prevalence Among Current Service Members Who Deployed to Overseas Contingency Operations and Veterans of Those Operations

PTSD was first included in the American Psychiatric Association's *Diagnosis and Statistical Manual of Mental Disorders* in 1980; for a diagnosis of PTSD, a person must have experienced a traumatic event and certain symptoms related to that trauma. A number of studies have addressed PTSD in service members or veterans. Estimates of the proportion of service members with PTSD generally range between 5 percent and 25 percent, depending on the study's methodology and the population sampled.¹

Some observers have looked to the prevalence of PTSD among veterans of the Vietnam War. Widely quoted is the National Vietnam Veterans Readjustment Study

(NVVRS), an extensive survey and analysis of mental health problems among Vietnam War veterans. Researchers using those data estimated that 15 percent of male Vietnam-theater veterans had combat-related PTSD at the time of the survey (1988), and 31 percent had experienced combat-related PTSD at some point in their lives prior to the survey.² A more recent reanalysis of a subsample of the NVVRS data found lower prevalence rates of 9 percent and lifetime prevalence of 19 percent as of 1988. The decrease in prevalence rates in the second analysis was largely attributed to a change in the methodology used to identify a case of PTSD.³ While prevalence rates among Vietnam War veterans are important for estimating the resources that group might require for future treatment, those rates are not good indicators of the likely prevalence rates for military members who have served in the Iraq and Afghanistan conflicts. Previous research shows that various factors—demographics, educational attainment, social support, combat intensity and injuries,

1. The range includes studies that reported frequencies of PTSD regardless of whether the study objective was to estimate the prevalence in a population of service members or veterans. For a survey of the literature, see Rajeev Ramchand and others, "Disparate Prevalence Estimates of PTSD Among Service Members Who Served in Iraq and Afghanistan: Possible Explanations," *Journal of Traumatic Stress*, vol. 23, no. 1 (February 2010), pp. 59–68.

2. Richard A. Kulka and others, *The National Vietnam Veterans Readjustment Study: Tables of Findings and Technical Appendices* (New York: Brunner/Mazel, 1990); and Richard A. Kulka and others, *Trauma and the Vietnam War Generation: Report of Findings from the National Vietnam Veterans Readjustment Study* (New York: Brunner/Mazel, 1990).

3. Bruce Dohrenwend and others, "The Psychological Risks of Vietnam for U.S. Veterans: A Revisit with New Data and Methods," *Science*, vol. 313, no. 979 (August 18, 2006), pp. 979–982. The diagnostic tool and methodology used in the reanalysis of the NVVRS differed from those used in the earlier study. The change in the diagnostic tool alone reduced the estimated prevalence of PTSD by 3 percentage points. Adjusting for changes in the clinical definition of PTSD and using additional data from personnel records decreased the prevalence rate an additional 3 percentage points.

and past psychiatric history, among others—affect whether service members will develop PTSD, and Vietnam veterans differ from veterans recently discharged from the military in some of those respects.⁴

Several recent studies have estimated the prevalence of PTSD among those who deployed to overseas contingency operations in Iraq and Afghanistan. Many have relied on the commonly used 17-item PTSD Checklist (PCL), in which veterans report their own symptoms, to screen for PTSD; relatively few of those studies surveyed members of all four military services or included reserve and National Guard as well as active-duty personnel.⁵ A 2008 RAND study based on a telephone survey of 1,965 service members and veterans who had returned from overseas contingency operations found that 14 percent screened positive for PTSD. Within that group, higher rates were observed among Army soldiers and National Guard and reserve personnel than among other groups; higher rates were observed for those with longer deployments; and higher rates were observed for those seriously injured during their deployment.⁶ A separate study by Smith and others reported new cases of PTSD in as few as 1 percent to 4 percent of deployed service members in the Air Force who did not experience combat exposure, but up to 9 percent for Army soldiers who had experienced certain combat-related traumas or exposures.⁷ Other studies have estimated the prevalence of

PTSD from data on service members' responses to the Department of Defense's (DoD's) screening test for that condition.⁸ Some estimates based on that test were on the higher end of the spectrum. For example, a study by Milliken and others found that between 6 percent and 12 percent of active Army personnel and between 6 percent and 13 percent of Army reservists screened positive for PTSD immediately upon returning from deployment to the Iraq war. The same study showed that assessments conducted three to six months after deployment yielded positive screening rates between 9 percent and 17 percent for active soldiers and between 14 percent and 25 percent for reserve soldiers.⁹

Issues in Reporting PTSD Prevalence Rates

There are two main problems in applying the published rates of PTSD to the entire population of OCO veterans. First, the studies relied on screening tools to establish a case of PTSD, and those instruments may not produce accurate estimates of the prevalence of the underlying condition. Second, the samples used in the studies were seldom representative of all personnel who deployed.

Screening Tools to Estimate PTSD Prevalence Rates.

Although studies usually estimate rates of possible PTSD using a screening questionnaire, those tools do not replace a clinician-determined diagnosis. Screening questionnaires are not comprehensive and do not determine whether all relevant criteria for a diagnosis have been met.¹⁰ Also, different researchers may use more or less stringent criteria to estimate the number of PTSD cases, which would result in dissimilar estimates even if the researchers used the same sample of service members and the identical screening tool.¹¹ Finally, because screen-

4. For example, recent veterans are more likely to have completed high school than were draftees during the Vietnam War. Also, American society may be more supportive of its returning service members now than it was during the Vietnam War.
5. Researchers may use different methods to determine whether an individual screens positive using the PCL. Under the cluster method, personnel screened positive if they reported at least one intrusion symptom, three avoidance symptoms, and two hyperarousal symptoms at the moderate level or higher. An alternate method requires assigning a number to the severity of each symptom ("not at all" = 0 points through "extremely bothered" = 5 points). To screen positive for PTSD, a score of at least 50 on a scale of 17 to 85 is often required.
6. Terri Tanielian and Lisa Jaycox, eds., *Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery*, (Santa Monica, Calif.: RAND Corporation, 2008).
7. Tyler C. Smith and others, "New Onset and Persistent Symptoms of Post-Traumatic Stress Disorder Self Reported After Deployment and Combat Exposures: Prospective Population Based U.S. Military Cohort Study," *British Medical Journal*, vol. 336, no. 7640 (February 16, 2008), pp. 366–371.

8. Upon service members' completion of their deployment, DoD administers the four-question Primary Care PTSD screen (PC-PTSD) in the Post-Deployment Health Assessment and, again, generally three to six months later, in the Post-Deployment Health Reassessment.
9. Charles S. Milliken and others, "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 (November 14, 2007), pp. 2141–2148. The prevalence estimates presented in that study are based on the DoD-administered Post-Deployment Health Assessment. The range in rates is the result of two alternate methods for determining PTSD: The lower rate reflects service members' endorsement of three or more symptom clusters from the four-item screening instrument, and the higher rate reflects the positive endorsement of two or more symptom clusters.

ing tools are imperfect, they generate false positives and false negatives; the resulting prevalence estimates, therefore, may diverge from the true prevalence rates. For conditions in which the underlying prevalence in the population is relatively low, a screen may be more likely to overestimate the number of cases, particularly when used as a clinical tool designed to capture as many potential cases as possible.¹²

Subsamples of the OCO Population. Most of the published studies on PTSD have examined a subsample of service members who have deployed to overseas contingency operations, often combat troops in the Army or Marine Corps, and excluded the more numerous support personnel (such as truck drivers or supply handlers) or personnel from the Navy and Air Force. Although those results may be important for estimating the prevalence of PTSD in the highest-risk units, they cannot be directly applied to the entire deployed force. Other military occupations and service branches are likely to see lower levels of combat when deployed and consequently to

experience lower levels of PTSD than the Army and Marine ground combat forces that have deployed, all else being equal. Even studies that attempt to survey the entire deployed force may not be representative because some service members may be more likely than others to respond to a survey. Furthermore, service members may not respond truthfully if they are concerned that reporting could result in stigma and possibly jeopardize their careers or delay their return home.¹³ In addition, methodological attempts to mitigate effects of unrepresentative samples may not be wholly successful. Because of those factors, the samples analyzed may either understate or overstate the prevalence of PTSD among service members who deployed to overseas contingency operations.

TBI Prevalence Among Current Service Members Who Deployed to Overseas Contingency Operations and Veterans of Those Operations

Measuring TBI in the OCO population also presents challenges. TBI results from an injury to the head, and the symptoms that follow the injury vary substantially. Research on the prevalence of TBI has been limited by inconsistent case definitions for TBI and the absence of ongoing population surveillance systems before the 1990s. Even now, the number of TBIs attributable to service in overseas contingency operations is difficult to measure. Many cases of TBI may never be recorded because medical attention may not have seemed necessary at the time of injury and because the Veterans Health Administration and the Department of Defense did not institute their population-based screening programs until 2007 and 2008, respectively.

Although investigation of the prevalence of TBI has not been as extensive as that for PTSD, some researchers have estimated the number of OCO service members who

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10. For example, the PCL (17-item checklist) and the PC-PTSD (four-item screen) do not explicitly establish significant distress or impairment in social, occupational, or other areas of functioning. In addition, the PCL does not ask whether the person was exposed to a traumatic event.
 11. Milliken presented data using two thresholds: answering positively to two or more questions and, alternatively, to three or more questions on the four-question PC-PTSD. Using the higher threshold almost halved (to 6 percent) the number of PTSD cases for active Army soldiers immediately after deployment.
 12. A 2004 study by Annabel Prins and others estimated that the PC-PTSD had a sensitivity of 0.77 and a specificity of 0.85 using a three-out-of-four question threshold. Those values imply that 77 percent of service members with PTSD screen positive (sensitivity equals 0.77), and 15 percent of those without the disease also screen positive (specificity equals 0.85). CBO estimates that, if the true population prevalence is 15 percent and 1,000 people are screened, a total of 244 people (24 percent) would be expected to test positive: 116 of the 150 people (77 percent) who have the disease, and 128 of the 850 people (15 percent) who do not (the false positives). In that case, the rate of screening positive is about 60 percent higher than the true prevalence of the disease. See Annabel Prins and others, "The Primary Care PTSD Screen (PC-PTSD): Development and Operating Characteristics: Corrigendum," *Primary Care Psychiatry*, vol. 9, no. 4 (2004), p. 151; Artin Terhakopian and others, "Estimating Population Prevalence of Posttraumatic Stress Disorder: An Example Using the PTSD Checklist," *Journal of Traumatic Stress*, vol. 21, no. 3 (June 2008), pp. 290–300; and Heidi Golding and others, "Understanding Recent Estimates of PTSD and TBI from Operations Iraqi Freedom and Enduring Freedom," *Journal of Rehabilitation Research and Development*, vol. 46, no. 5 (2009), pp. vii–xiii.

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13. One study by McLay and others illustrates that type of reporting problem. Using a sample of medical personnel within the Department of Defense, the study found that delivering the PCL anonymously generated double the rate of positive PTSD cases than found in PCL results that become part of a service member's medical record. However, generalizing those results is problematic because the respondents to the anonymous screen were a small subset of the larger population and may not have been representative. See Robert N. McLay and others, "On-the-Record Screenings Versus Anonymous Surveys in Reporting PTSD," *American Journal of Psychiatry*, vol. 165, no. 6 (June 2008), pp. 775–776.

screen positive for TBI or continue to have symptoms of TBI. Researchers generally estimate that the proportion of service members deployed to overseas contingency operations who experienced a TBI (including those who were no longer symptomatic) is between 15 percent and 23 percent, depending on the study's methodology and sample; their estimates of the portion of service members who continue to experience symptoms over the longer term (that is, who continue to have symptomatic TBI) range from 4 percent to 9 percent.

A study by Hoge and others found that 15 percent of soldiers in two Army infantry brigades returning from deployment to Iraq screened positive for experiencing a mild TBI.¹⁴ A 2008 RAND study that was based on a telephone survey of OCO service members and veterans reported a probable TBI prevalence of almost 20 percent.¹⁵ A paper by Terrio and others estimated that 23 percent of soldiers in an Army brigade combat team returning from a one-year deployment to Iraq had experienced a TBI while deployed.¹⁶ That paper also examined the frequency of continued medical complaints that may be attributed to TBI, including headache, irritability, dizziness, balance problems, and memory difficulties. The authors found that 9 percent of personnel within the brigade reported at least one ongoing symptom potentially related to TBI, and 4 percent reported a minimum of two ongoing symptoms at the time of the screening, a few days after returning home from deployment. By comparison, VHA researchers have found that 7 percent of OCO veterans who are screened receive a diagnosis of symptomatic TBI.¹⁷ In part because there are no validated clinical criteria for symptomatic TBI, estimates from these studies are not comparable.

14. Charles W. Hoge and others, "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.

15. Tanielian and Jaycox, eds., *Invisible Wounds of War*.

16. Heidi Terrio and others, "Traumatic Brain Injury Screening: Preliminary Findings in a U.S. Army Brigade Combat Team," *Journal of Head Trauma Rehabilitation*, vol. 24, no. 1 (January–February 2009), pp. 14–23.

17. Ann Hendricks and others, "Screening for Mild Traumatic Brain Injury in OEF-OIF Deployed Military: An Empirical Assessment of the VHA Experience" (paper presented at the National Conference of VA's Health Services Research and Development Service, Washington, D.C., February 2011).

Issues in Reporting TBI Prevalence Rates

The rates of TBI reported in those published studies should not be interpreted as the prevalence for the whole population of service members deployed in support of the conflicts in Iraq and Afghanistan. Estimates of TBI in those studies are problematic for several reasons: Studies use different sets of diagnosis codes to approximate the number of TBI cases; they rely on screening instruments for TBI rather than clinical diagnoses at or near the time of injury; and they use samples that are not representative of the entire deployed force. Furthermore, even if the prevalence of TBI could be precisely determined, the extent of impairment and consequent need for continuing medical care are unknown.

Diagnosis Codes to Estimate TBI Prevalence Rates.

Studies that provide estimates of TBI frequency based on diagnosis codes are problematic. For one thing, not everyone with a TBI will seek treatment and receive a diagnosis, which leads to underestimates. For another, there is no single diagnosis code to identify TBIs. The codes identify several types of injuries to the head, distinguished by the section of the head injured rather than by the severity of injury to the brain itself. Researchers have employed different collections of codes to estimate the number of TBIs.

Screening Tools to Estimate TBI Prevalence Rates.

Studies have generally relied on screening tools or questions that are based on the Brief Traumatic Brain Injury Screen (BTBIS) to identify possible TBIs.¹⁸ The BTBIS does not replace a clinician-determined diagnosis at the time of injury. Indeed, the accuracy of the BTBIS is not known because it has not been psychometrically validated against clinicians' diagnoses at or near the time of injury.

18. To view the questionnaire, see "3 Question DVVIC TBI Screening Tool Instruction Sheet," available at www.dvbic.org/images/pdfs/3-Question-Screening-Tool.aspx. That screening tool asks service members to identify injuries that occurred during deployment by certain mechanisms such as an explosion or a fall; it asks whether any injuries resulted in a change in consciousness, such as "seeing stars," immediately following the event; and it also asks the respondents, "Are you currently experiencing any of the following problems that you think might be related to a possible head injury or concussion?" It does not ask whether symptoms may be related to other causes. RAND researchers considered the test positive for TBI if the individual endorsed any of the injuries listed in the first question and reported any alteration of consciousness detailed in the second question. Terrio used the same screening criteria but followed up with a clinical assessment. Hoge queried soldiers on a smaller set of changes in consciousness than the BTBIS offers.

When the BTBIS is compared with a structured clinical interview that may occur several months after the injury, VHA researchers have found that the screen correctly identifies the vast majority of OCO veterans who remain symptomatic but also falsely identifies a large number of people.¹⁹ Because the screen was designed as a clinical tool to identify as many cases of TBI as possible, studies relying on that tool are likely to overestimate, perhaps significantly, the prevalence of both TBI and TBI with persistent symptoms. Also, the timing of the screening may result in substantially different responses in the same population.²⁰

Sample Selection. Sample selection is also problematic when estimating the prevalence of TBI, much as it is for PTSD. Studies have tended to focus on combat troops returning to their units. Even in the few studies that did survey active-duty personnel from all four branches of service, not just Army soldiers, certain groups of service members were either undersampled or oversampled.

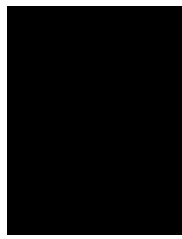
19. Kerry T. Donnelly and others, "Reliability, Sensitivity, and Specificity of the VA Traumatic Brain Injury Screening Tool," *Journal of Head Trauma Rehabilitation*, vol. 26, no. 6 (November–December 2011), pp. 439–453; also see Karen A. Schwab and others, "Screening for Traumatic Brain Injury in Troops Returning from Deployment in Afghanistan and Iraq: Initial Investigation of the Usefulness of a Short Screening Tool for Traumatic Brain Injury," *Journal of Head Trauma Rehabilitation*, vol. 22, no. 6 (November–December 2007), pp. 377–389.

20. One study found that the self-reported concussion rate was 9 percent about one month before soldiers returned home from deployment but jumped to 22 percent when the same sample was surveyed one year after deployment. See Melissa A. Polusny and others, "Longitudinal Effects of Mild Traumatic Brain Injury and Posttraumatic Stress Disorder Comorbidity on Postdeployment Outcomes in National Guard Soldiers Deployed to Iraq," *Archives of General Psychiatry*, vol. 68, no. 1 (January 2011), pp. 79–89.

Although combat troops are much more likely to experience a TBI (and thereby inflate estimates of TBI prevalence), a sample of soldiers who return to their units does not include severely injured service members who have been medically evacuated from the combat theater; excluding medical evacuees from the sample underestimates the prevalence of TBI.

Extent of Impairment. Finally, even if the number of TBIs sustained in combat theater could be accurately determined, an important issue remains in understanding the impact of TBI on the health care needs of the OCO population: The degree of impairment is unknown. Even a clinical diagnosis at or shortly after a TBI occurs indicates only that an injury was sustained; it does not reveal the persistence or intensity of symptoms at the time of the diagnosis. Indeed, the literature indicates that the vast majority of individuals who experience a mild TBI recover spontaneously over a period of a few weeks or months. In addition, for some who remain symptomatic, many of the neurological and physiological indicators and limitations arising from TBI (headaches, memory difficulties, sleep problems) are not specific to the injury and may be caused by either the TBI or other conditions, complicating clinical assessment of TBI.²¹ Studies that report rates of symptomatic TBI show substantially lower rates than studies that measure the number of service members who sustained a TBI during deployment to a combat theater.

21. See Heather Belanger and others, "The Veterans Health Administration System of Care for Mild Traumatic Brain Injury: Costs, Benefits, and Controversies," *Journal of Head Trauma Rehabilitation*, vol. 24, no. 1 (2009), pp. 4–13; also see Charles W. Hoge and others, "Care of War Veterans with Mild Traumatic Brain Injury—Flawed Perspectives," *New England Journal of Medicine*, vol. 360, no. 16 (April 16, 2009), pp. 1588–1591.



Appendix D: VHA's Average Annual Costs for OCO Veterans Who Continue to Seek Care

In this study, the Congressional Budget Office (CBO) calculated average costs per patient of health care services for each treatment year by dividing costs in that year (the numerator) by the number of patients who ever used VHA's services and remained in the sample that year (the denominator). (For the denominator for each treatment year, see the number of potential patients in Table D-1.) That method yields costs for specific groups of new OCO veterans, including some who used VHA only once and others who used VHA more frequently or even continually. Those results are presented in the main text of this study.

An alternative way to calculate average costs in a treatment year is to include in the denominator only those patients who continued to receive health care in each subsequent year. (For the denominator for each treatment year using that method, see the number of patients using VHA in Table D-1.) That method will produce higher annual average costs per patient, because the total cost for treating patients each year is divided by the number of patients who used services in that year (consequently, the denominator is smaller). In this appendix, CBO presents average costs using the second method. The first

approach provides the cost for treating a given group of veterans; the second approach provides the cost for treating a group of veterans who are continually seeking care.

After the first year of treatment, average annual costs for patients using VHA were higher than for potential patients, because some of the potential patients had no VHA costs associated with them (see Table D-2). Differences in average costs for the two samples were most pronounced for patients who had neither PTSD nor TBI. For that category of patients, the average cost of treatment in year 4 for patients using VHA (\$2,300) was more than twice the cost for potential patients (\$1,000, shown in Table 2 on page 19). Because so many veterans with PTSD and with both PTSD and TBI continued to use VHA care, differences in average cost between the two samples were much smaller for veterans diagnosed with those conditions. By treatment year 4, the average cost for patients using VHA with PTSD (\$5,100) was 34 percent more than for potential patients with PTSD (\$3,800). For veterans with both PTSD and TBI, the average annual cost for patients using VHA was only \$400 more than the cost for potential patients.

Table D-1.
Sample Sizes

Treatment Group	Patients Using VHA	Potential Patients in Group	Share of Patients Using VHA (Percent)
Treatment Year 1			
PTSD or TBI			
PTSD ^a	103,500	103,500	100
TBI ^b	8,700	8,700	100
Both PTSD and TBI	26,600	26,600	100
No PTSD or TBI	358,000	358,000	100
Treatment Year 2			
PTSD or TBI			
PTSD ^a	55,600	69,100	80
TBI ^b	2,800	3,600	78
Both PTSD and TBI	17,500	18,600	94
No PTSD or TBI	124,100	248,800	50
Treatment Year 3			
PTSD or TBI			
PTSD ^a	33,600	43,800	77
TBI ^b	800	1,200	67
Both PTSD and TBI	10,000	10,600	94
No PTSD or TBI	77,400	177,800	44
Treatment Year 4			
PTSD or TBI			
PTSD ^a	18,600	24,600	76
TBI ^b	400	600	67
Both PTSD and TBI	5,300	5,500	96
No PTSD or TBI	48,600	115,300	42

Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for up to the first four years of treatment. Data exclude 500 patients, many with PTSD and TBI, who entered VHA at Polytrauma Rehabilitation Centers.

VHA = Veterans Health Administration; PTSD = post-traumatic stress disorder; TBI = traumatic brain injury.

- a. Patients in the PTSD group did not have TBI, but many had other conditions.
- b. Patients in the TBI group did not have PTSD, but many had other conditions.

Table D-2.

Alternative Calculation of Average Costs for All of VHA's Health Care Provided to OCO Patients

(Dollars)

Treatment Group	Treatment Year 1	Treatment Year 2	Treatment Year 3	Treatment Year 4
PTSD or TBI				
PTSD ^a	8,300	5,200	5,100	5,100
TBI ^b	11,700	6,000	10,800	18,300
Both PTSD and TBI	13,800	8,900	9,300	10,200
No PTSD or TBI	2,400	2,300	2,300	2,300

Source: Congressional Budget Office based on data from the Department of Veterans Affairs, Veterans Health Administration.

Notes: Data cover fiscal years 2004 to 2009 for up to the first four years of treatment. Data exclude about 500 patients, many with PTSD and TBI, who entered VHA at Polytrauma Rehabilitation Centers.

Average annual costs are based on the number of OCO patients who sought treatment in a given year.

VHA converted costs provided to CBO to fiscal year 2009 dollars based on annual increases in the average cost of a primary care visit from 2004 to 2009. CBO then indexed those costs to 2011 dollars using the GDP deflator.

VHA = Veterans Health Administration; OCO = overseas contingency operations; PTSD = post-traumatic stress disorder;
TBI = traumatic brain injury.

- a. Patients in the PTSD group did not have TBI, but many had other conditions.
- b. Patients in the TBI group did not have PTSD, but many had other conditions.

