

# Invisible Wounds of War

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

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## **Predicting the Immediate and Long-Term Consequences of Post-Traumatic Stress Disorder, Depression, and Traumatic Brain Injury in Veterans of Operation Enduring Freedom and Operation Iraqi Freedom**

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### **The Challenge of Predicting the Future**

Although there is an emerging consensus that mental health and cognitive conditions stemming from service in Afghanistan and Iraq are likely to have severe and broad consequences if left untreated, allocating resources toward particular treatments and interventions requires a detailed understanding of what the consequences of these problems are likely to be. For example, if it can be reasonably assumed that servicemembers will manifest any mental health or cognitive conditions immediately upon return from deployment, then initial assessments will be sufficient to identify those who may require extra support. In contrast, if there are reasons to expect delayed reactions to deployments, then continued assessments of returning servicemembers would be warranted. Similarly, recommended treatment and policy options would differ according to the range of outcomes likely to be affected by veterans' and servicemembers' mental, emotional, and cognitive conditions.

But projecting the likely consequences of mental health and cognitive conditions suffered by returning servicemembers is complicated for several reasons. First, the mental health and cognitive problems of returning servicemembers may wax and wane over time. The short-term consequences of these problems may differ from consequences evolving over the long term. Moreover, even with treatment, symptoms may fluctuate for individuals, clouding attempts to predict future consequences. Second, there are limited data describing the mental health problems of individuals who have served in Afghanistan and Iraq. Not only are these problems yet to be studied extensively, but there has not yet been sufficient time to evaluate how veterans and servicemembers and their families may be affected in the long run.

Despite these complications, there are several legitimate bases for projecting the likely short-term and long-term consequences of the mental health and cognitive problems experienced by Operation Enduring Freedom (OEF) and Operation Iraqi Free-

dom (OIF) veterans. An extensive and rich body of research has examined the long-term consequences of traumatic experiences during prior military conflicts. To the extent that the results of these studies can be generalized to veterans of the current conflicts, they provide a reasonable foundation to guide projections. In addition, each of the conditions that are the focus of current concerns for returning servicemembers has been studied extensively in civilian populations. To the extent that the development and effects of these conditions in the civilian population generalize to the experiences of servicemembers, these literatures may also serve as a basis for projecting future needs of OEF/OIF veterans.

## **Goals and Scope of Our Discussion**

In this part, we draw on the available literature to describe the likely immediate and emergent consequences of the invisible wounds of war—the mental, emotional, and cognitive injuries sustained during deployment to Afghanistan and Iraq. Our goal was to understand how these conditions would affect veterans and servicemembers, their families, and society, the duration of the consequences, and the range of services likely to be needed.

We focused our literature review on the correlates and consequences of three major mental health and cognitive conditions: post-traumatic stress disorder (PTSD), major depression and depressive symptoms, and traumatic brain injury (TBI). We focused on these disorders because they are the ones being assessed most extensively in servicemembers returning from combat. In addition, there are obvious mechanisms that might link each of these disorders to specific experiences in war—i.e., PTSD is a reaction to a traumatic experience, depression can be a reaction to loss, and TBI is a reaction to injury.

## **Theoretical Perspectives on the Consequences of Mental Health and Cognitive Conditions**

PTSD, major depression, and TBI are conceptually distinct conditions, with different etiologies, symptoms, and recommended treatments. Nevertheless, from the perspective of understanding how these conditions affect the lives of those who suffer from them, developmental processes are likely to be common to all three. Here, we summarize prominent theoretical perspectives that suggest how mental, emotional, and cognitive impairments may give rise to additional problems and deficits over the life of an afflicted individual. We then draw on elements of these perspectives to create a general framework within which to view the empirical reviews.

### The Stress-Diathesis Model

A common starting point for theories of illness and resilience is the stress-diathesis model, first articulated by Zubin and Spring (1977) as a framework for understanding the origins of schizophrenia. The stress-diathesis model is based on the premise that individuals vary in their levels of *diathesis*—i.e., those individual and environmental characteristics that increase their vulnerability to disease (Brewin, 1998; Hèänninen and Aro, 1996). Individual sources of vulnerability include pre-existing mental health problems, lack of education, experiences of criminal behavior or substance abuse, and a family history of mental disorders. Circumstantial sources of vulnerability include poverty, social isolation, lack of adequate employment, and physical distance from resources and potential avenues of support.

The central insight of the stress-diathesis model is that the presence of a diathesis, or vulnerability, is, by itself, insufficient to bring about a mental disorder. Vulnerable individuals will be most likely to experience the onset of problems when they are confronted by stress, and they may function normally in its absence (Kendler, Gardner, and Prescott, 2002).

Although the stress-diathesis model was designed and has mostly been applied toward understanding the origins of mental disorders, the principles of the model apply equally well to understanding the consequences of such disorders. From this perspective, the presence of a condition such as major depressive disorder (MDD), PTSD, or TBI may be considered a diathesis—i.e., a source of vulnerability. For any outcome or negative consequence of experiencing these conditions, an individual will be most at risk to the extent that (1) the individual has other vulnerabilities and (2) the individual encounters stressful or demanding events that tax resources and energy that are already limited by the condition and other vulnerabilities. Thus, for example, this model suggests that a servicemember returning from combat with a particular condition is most likely to experience negative consequences of that condition to the extent that the servicemember has other vulnerabilities and encounters stressful events and circumstances.

The stress-diathesis model has a number of important implications for minimizing negative consequences in servicemembers who suffer from mental health and cognitive conditions. *With respect to identifying those in greatest need:* Understanding individual vulnerability requires assessing not only the condition but also other possible sources of vulnerability, such as access to social support, the experience of other mental or physical illnesses, and the quality of family relationships. *With respect to protecting those in need:* Programs and policies that reduce vulnerability to further negative consequences (e.g., by ensuring extended health care coverage, promoting post-service employment) may be useful complements to treatments that directly address the symptoms of the condition.

### Life-Span Developmental Perspectives

The stress-diathesis model offers a powerful framework for understanding who may be at risk for problems and when those problems are likely to occur. However, the model is silent regarding how mental disorders give rise to further difficulties throughout the life course. Theories of life-span development (e.g., Baltes, 1987; Ceci and Hembrooke, 1995; Zoccolillo et al., 1992) describe two distinct mechanisms to account for how mental disorders may give rise to future problems (e.g., Caspi, 1987; Elder, Pavalko, and Hastings, 1991).

The first mechanism is *interactional continuity*—the idea that enduring qualities of an individual affect the way that individual interacts with others, who generally respond in kind. Thus, aggressive individuals behave in ways that beget aggressive responses, and withdrawn individuals behave in ways that exacerbate their isolation. As a result of this form of continuity, the interpersonal relationships of both types of individuals tend to suffer and get worse over time (Caspi, Elder, and Bem, 1987, 1988). Interactional continuity highlights the ways that mental health and cognitive conditions, to the extent that they impair interpersonal functioning, can have lasting consequences for how individuals make their way in the world.

A second mechanism described by this perspective is *cumulative continuity*—the idea that behaviors and choices at each stage of life have consequences that accumulate to shape and constrain an individual's options at subsequent stages of life. Cumulative continuity highlights the ways that negative consequences can emerge over time. For example, servicemembers who are aggressive and uncontrolled upon return from deployment are likely to suffer professionally and socially. Especially after they separate from the structured environment of the military, the consequences of their behavior may accumulate, limiting their options for productive employment. Constrained economically, their options for maintaining and supporting successful family relationships are similarly limited (Caspi, Elder, and Bem, 1987). Thus, over time, the immediate symptoms of a condition may trigger a cascade of negative consequences that substantially affect later stages of life.

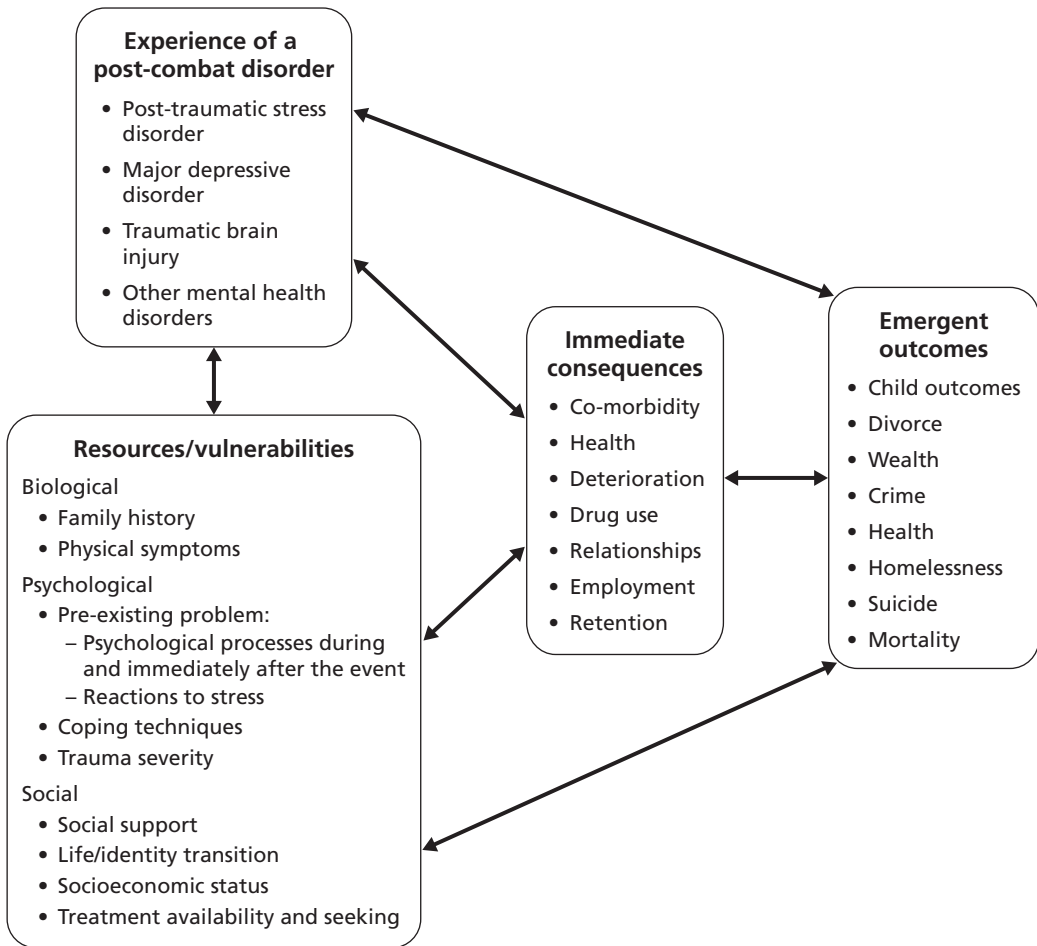
Applied specifically to servicemembers suffering from mental disorders, the life-span developmental perspective suggests that impairments observed immediately after a servicemember returns from combat may have consequences for a broad range of outcomes through two primary mechanisms. A condition alters the way the servicemember interacts with intimates, family members, and professional colleagues, impairing these relationships. A condition may also give rise to concrete outcomes (e.g., incarceration, substance abuse, unemployment) that significantly shape situations that the individual and family members will face later in life.

### An Integrated Model of the Consequences of Post-Combat Mental Health and Cognitive Conditions

We have developed a general framework that incorporates elements from the stress-diathesis model and the life-span developmental perspective (see Figure 5.1). The logic of the model can be expressed as a series of propositions:

- Even individuals who share a common diagnosis may have symptoms that range from mild to severe.
- Impairments arising from post-combat mental health and cognitive conditions have direct, negative consequences for individual outcomes.

**Figure 5.1**  
**A Model of the Consequences of Post-Combat Mental Health and Cognitive Conditions**



- A servicemember's resources and vulnerabilities can alter the immediate consequences of these conditions.
- Sufficient resources can act as a buffer, protecting individuals and minimizing the immediate consequences of these conditions, whereas significant vulnerabilities and other sources of stress can exacerbate the negative consequences of a condition.
- Over the life span, the immediate consequences of these disorders may themselves have long-term consequences for individuals and their family members.
- The immediate and emergent consequences of mental health and cognitive conditions feed back to affect the course of the condition.

This integrative model describes the consequences of post-combat mental health and cognitive conditions as a cascade of negative outcomes that, in the absence of intervention, can accumulate to affect a broad range of domains over the life span of the afflicted individual. Moreover, the model draws attention to events and circumstances external to the individual (e.g., the presence or absence of other sources of stress and support) that make a negative cascade more or less likely to occur. One implication of this perspective is that, to the extent that they prevent or ameliorate the short-term consequences of these conditions, early interventions may have significant indirect long-term benefits. A second implication is that interventions and policies that focus solely on ameliorating the specific symptoms of these conditions may be too narrow. On the contrary, the model suggests that programs that provide afflicted servicemembers with a supportive environment and the means by which to cope with their conditions may prove important complements to traditional interventions that treat each condition directly.

## **Empirical Research on the Consequences of Post-Combat Mental Health and Cognitive Conditions**

To describe the range of personal, familial, and social outcomes likely to be affected by these disorders, we conducted a search of the scientific literature on the correlates and consequences of post-traumatic stress disorder, major depression and depressive symptoms, and traumatic brain injury. The full review is available as a RAND working paper titled *Invisible Wounds: Predicting the Immediate and Long-Term Consequences of Mental Health Problems in Veterans of Operation Enduring Freedom and Operation Iraqi Freedom* (available at <http://veterans.rand.org>), and we present here material that appears in expanded form in that paper. When possible, our review addressed research that examined these issues within military populations. When such research was unavailable, we reviewed and extrapolated from the extensive bodies of research that have examined the correlates and consequences of these conditions in civilian populations.

These literatures are massive and extend back decades; of necessity, we have been selective, drawing upon studies that used methods of sampling and assessment that experts consider the most reliable. When possible, we have favored *longitudinal research*, which follows individuals over time. Because the military recruits from the population over 18 years old, we have focused exclusively on research on adults.

Below we briefly summarize the key research findings for each of the following outcomes: other mental health problems; suicide; physical health and mortality; substance use and abuse; employment and productivity; homelessness; and marriage, parenting, and child outcomes.

### **Co-Morbidity and Other Mental Health Problems**

*Co-morbidity of conditions* refers to two or more conditions co-occurring simultaneously. In civilian populations, individuals with co-occurring mental, medical, and substance use disorders have been shown to have more-severe symptoms, require more-specialized treatment, have poorer outcomes to treatment, and experience more disability in social and occupational functioning than individuals with one condition alone (Greenfield et al., 1998; Olfson et al., 1997; Ormel et al., 1994; Shalev et al., 1998). Co-occurring disorders among military personnel returning from Afghanistan and Iraq may be of particular concern because of the high estimates of co-morbidity found among individuals with PTSD. We know from research in the general population that about 88 percent of men and 79 percent of women with PTSD also experience one other disorder in their lifetime and that about half have three or more co-morbid diagnoses (Kessler, Sonnega, et al., 1995). These estimates are supported by other research showing that individuals with PTSD also have an average of 2.7 other diagnoses and that the number of co-morbid disorders increases with PTSD severity (Marshall et al., 2001). Although little research has examined rates of co-morbidity specifically within the current military cohort, rates of PTSD among returnees may offer preliminary insights into the co-morbidity rates we might anticipate.

**PTSD and Depression.** In civilian populations, PTSD and depression frequently co-occur. For example, among trauma survivors from a hospital emergency room, 78.4 percent of those with a diagnosis of PTSD experienced depression at some point in their lifetime following their PTSD diagnosis (Shalev et al., 1998). Within the current military cohort, a study of hospitalized soldiers assessed between March 2003 and September 2004 found that about 6.3 percent of the sample met criteria for both depression and PTSD up to seven months after injury (Grieger et al., 2006). In our own survey, we found that approximately two-thirds of those with PTSD also have probable major depression. Some evidence suggests that individuals with co-morbid PTSD and depression have more negative consequences than persons with either diagnosis alone. In one study, veterans in a VA setting with co-morbid depression and PTSD had more-severe depression, lower social support, more suicide ideation, and more-frequent primary care and mental health care visits than did individuals with depression only

(Campbell et al., 2007). Another study found that individuals with these dual diagnoses had more-severe symptom severity and lower levels of functioning (Shalev et al., 1998).

**TBI and Depression.** In civilian populations, co-morbidity between TBI and depression is common and can be experienced within months following the brain injury (Moldover, Goldberg, and Prout, 2004) and for many years after the injury (Busch and Alpern, 1998). The prevalence of depression among those with a brain injury varies between 15 and 61 percent (Deb et al., 1999; Kim et al., 2007). For example, among World War II veterans with penetrating head injury, 19 percent had a lifetime prevalence of depression compared with an estimated prevalence of depression of 13 percent among those without a head injury (Holsinger et al., 2002). One reason for the wide range in estimates is that symptoms of TBI overlap substantially with symptoms of depression, which makes it challenging to differentiate symptoms of depression from TBI (Babin, 2003; Kim et al., 2007). Our own survey found that one-third of those with TBI also meet criteria for depression. Depression may also develop indirectly years after an injury as a result of TBI-related consequences and maladaptive readjustment (Moldover, Goldberg, and Prout, 2004). In addition, individuals with comorbid TBI and depression experience more functional impairment, more anxiety and aggressive behavior, and poorer social functioning, and they perceive their disabilities to be more severe than those with either condition alone (Fann et al., 1995; Jorge et al., 2005). Furthermore, individuals with TBI that develop MDD are at higher risk of cognitive disability, anxiety disorders, and poorer quality of life than are individuals who do not develop MDD (Levin et al., 2001). Among those with TBI, risk factors for developing depression include stress, social isolation, maladaptive coping, and lateral lesions (Kim et al., 2007).

**TBI and PTSD.** The co-morbidity between PTSD and TBI has been a controversial topic, because one symptom of TBI is the loss of consciousness or amnesia of the traumatic event, whereas an integral symptom of PTSD is a re-experiencing of the event. Experts in the literature have argued that, if individuals with TBI are unconscious at the time of the trauma, they therefore cannot retain the memories of the event to experience subsequent PTSD symptoms. Yet, recent research suggests that both diagnoses can co-occur either through a subconscious/implicit level or through social reconstruction (Joseph and Masterson, 1999). A study of U.S. Army infantry soldiers surveyed three or four months after return from Iraq showed that, among those reporting a TBI with loss of consciousness, 43.9 percent also reported symptoms consistent with PTSD. This percentage is greater than that for those reporting TBI with altered mental status, 27.3 percent; those reporting other injuries, 16.2 percent; and those with no injury, 9.1 percent (Hoge et al., 2008). Our survey (see Chapter Four) found that one-third of servicemembers with a probable TBI also met criteria for probable PTSD. Thus, it appears that there may be a strong association between TBI and PTSD, although there

is very little supporting literature to date; research on this association is in its early stages.

**Co-Morbidity with Other Psychiatric Disorders: PTSD.** Among individuals with PTSD, the most common co-morbidities are with depression, substance use, and other anxiety disorders (Brady et al., 2000). For example, in the National Comorbidity Survey, PTSD was co-morbid with affective, anxiety, conduct, and alcohol/substance use disorders among men and women (Kessler, Sonnega, et al., 1995). Among patients in primary care with a diagnosis of PTSD, about 65 percent met criteria for another disorder, with the most common co-occurring diagnoses as phobia, major depression, and bipolar depression (Olfson et al., 1997). Rates of co-morbidity also increase as PTSD symptoms increase. Co-morbid anxiety disorders (e.g., panic disorder, social phobia, generalized anxiety, or obsessive-compulsive disorder) are associated with increasing PTSD symptoms (Marshall et al., 2001), suggesting that individuals are at increased risk for co-occurring disorders as PTSD symptoms worsen. These other psychiatric disorders also have adverse consequences. For instance, within the military, social phobia and current social anxiety have been associated with anxiety, reports of shame experienced pre-military, and homecoming adversity (Orsillo et al., 1996). Panic disorder is another anxiety disorder that overlaps with symptoms of PTSD (e.g., hypervigilance) and has been shown to be more common among veterans that were exposed to combat (Deering et al., 1996).

**Co-Morbidity with Other Psychiatric Disorders: TBI.** Rates of TBI have been associated with increased risk of psychiatric disorders—specifically, anxiety (Moore, Terryberry-Spohr, and Hope, 2006), depressive disorders, and substance use (Anstey et al., 2004; Hibbard et al., 1998; Silver et al., 2001). Rates of co-morbidity between TBI and other psychiatric disorders may be associated with more-complex and more-severe TBI than are milder forms of TBI. In a study of individuals with mild TBI, most patients recovered completely, but those who had poorer recovery outcomes were more likely to have depression and anxiety disorders (Mooney and Speed, 2001). TBI is also co-morbid with chronic pain, a condition that has a long and pervasive course after injury. Among patients in a brain injury rehabilitation center, 58 percent with mild TBI and 52 percent with moderate-to-severe TBI had chronic pain (Lahz and Bryant, 1996). Co-occurring TBI and chronic pain have been associated with longer treatment stays than has chronic pain alone (Andary et al., 1997).

**Co-Morbidity with Other Psychiatric Disorders: Depression.** About 45 percent of individuals with past-year depression diagnoses experience at least a second co-occurring diagnosis (Kessler, Chiu, et al., 2005), and depression is rarely the primary diagnosis (Kessler, Berglund, et al., 2003). As expected, slightly higher rates of co-morbidity are found with a treatment-seeking population in primary care and psychiatric outpatient settings; estimates of a co-morbid disorder among those with depression are about 65 percent (Olfson et al., 1997; Zimmerman, Chelminski, and McDermut, 2002). A recent general-population study using the National Epidemiologic Survey of Alcohol-

ism and Related Conditions (NESARC) found that having major depression within the past year was most commonly associated with personality disorders (38 percent), anxiety disorders (36 percent), nicotine dependence (26 percent), alcohol use disorders (14 percent), and drug use disorders (5 percent). The most common personality disorders were obsessive-compulsive, paranoid, and schizoid disorders; the most common anxiety disorders included specific phobia, generalized anxiety, and social phobia. Depression severity is significantly and positively correlated with impaired functioning (Hasin et al., 2005).

**Summary.** Co-occurring disorders are common among individuals with TBI, depression, and PTSD, and they often result in more-negative outcomes than for individuals experiencing any of the disorders alone. Among other co-morbid diagnoses, anxiety and mood disorders seem to be most common for all diagnoses, plus chronic pain for TBI. Individuals with co-occurring disorders tend to have more-severe and more-complex symptoms, require specialized treatment, and often experience more distress associated with their disorders.

### **Suicide**

Suicide is one of the leading causes of death among 10- to 44-year-olds in the United States, although it is still relatively rare, with a rate of around 10 per 100,000 persons (Heron and Smith, 2007). Among persons who have committed suicide, the majority have had one or more mental disorders, making psychiatric problems one of the strongest risk factors of this outcome (Harris and Barraclough, 1997). Accordingly, concerns about elevated rates of mental disorders among servicemembers returning from Afghanistan and Iraq lead to concerns about elevated rates of suicides as well.

**Suicide in the Military.** There is a long-standing concern about suicide among military personnel. According to the Department of Defense, in 2003 the rate of suicide across the armed forces was roughly 10 to 13 (depending on military branch) per 100,000 troops (Allen, Cross, and Swanner, 2005), an estimate that is comparable to the rate of suicide across all ages in the United States (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2007). However, while these figures and others (Lehmann, McCormick, and McCracken, 1995; Rothberg et al., 1990) may indicate that military personnel do not face a risk of suicide different from that of the general population, population-based studies have indicated that male veterans face roughly twice the risk of dying from suicide as their civilian counterparts (Kaplan et al., 2007). Analyses focused specifically on veterans of the Vietnam War indicate that these veterans were at increased risk of suicide-related mortality relative to veterans who did not serve in Vietnam; however, this increased risk occurred within five years from discharge from active duty, and the difference did not persist after this time (Boehmer et al., 2004). In 2006, there were 97 suicides among active duty Army soldiers (including members of the Reserve Component on active duty), and close to

two-thirds of these had a history of at least one deployment to Afghanistan or Iraq (U.S. Department of the Army, Army Behavioral Health Technology Office, 2007)

**Depression, PTSD, TBI, and Suicide.** Depression, PTSD, and TBI all increase the risk for suicide. Psychological autopsy studies of civilians have consistently shown that a large number of suicides had a probable depressive disorder (Cavanagh et al., 2003; Henriksson et al., 1993; Isometsa, 2001). In a population-based study of civilians, 16 percent of those persons with a lifetime history of MDD had a lifetime history of one or more self-reported suicide attempts (Chen and Dilsaver, 1996). In the National Comorbidity Survey, persons with a lifetime history of a major depressive episode were 10 times more likely to report having thought about killing themselves and 11 times more likely to have made a nonfatal suicide attempt. The risk was even greater when the definitional criterion for depression was modified to exclude having thoughts of death, which could have potentially confounded the effect of depression on suicide outcomes (Kessler, Borges, and Walters, 1999). Among suicides over a one-year period across the VA medical center, 30 percent had an unspecified affective disorder, and 40 percent of patients who had attempted suicide had an affective disorder (Lehmann, McCormick, and McCracken, 1995).

Although not as strongly associated with suicide as depression, PTSD is more strongly associated with suicide ideation and attempts than any other anxiety disorder (Kessler, Borges, and Walters, 1999). In the National Comorbidity Survey, two different studies have indicated that persons with lifetime PTSD were significantly more likely to report having thought about killing themselves and to have made an attempt, even after accounting for a variety of potential sociodemographic and mental health confounding factors (Kessler, Borges, and Walters, 1999; Sareen et al., 2005). Among a sample of 100 Vietnam veterans with PTSD at a VA hospital, 19 had made a suicide attempt and 15 more had been “preoccupied” with thoughts of suicide since the war (Hendin and Haas, 1991). Psychological autopsies have also indicated that PTSD is linked to suicide deaths. In a study of Vietnam veterans, those who died from suicide were more likely to have symptoms of PTSD than a comparison group who died in motor vehicle crashes (Farberow, Kang, and Bullman, 1990).

Finally, research also has consistently shown that persons with TBI have a higher risk of suicide than persons without TBI. Among outpatients with TBI, 23 percent reported suicide ideation and 18 percent reported having made a suicide attempt post-injury (Simpson and Tate, 2002); in a similar sample, 26 percent of TBI outpatients had made a suicide attempt (Simpson and Tate, 2005). In a community-based sample, persons with a self-reported history of a “severe head trauma with loss of consciousness or confusion” had a higher lifetime risk of having attempted suicide (Hibbard et al., 1998). Using multiple years of population registry data, Teasdale and Engberg (2001) found that persons with concussions, cranial fractures, and cerebral contusions or traumatic intracranial hemorrhages each had at least a three-times-higher incidence rate of suicide mortality than the general population, after adjusting for sex and age.

**Correlates and Modifiers of Suicide Risk.** Research on suicide has identified a number of covariates, or factors, that are either correlated with suicide independent of depression, PTSD, and/or TBI or that modify the risk of these disorders on suicide outcomes. For example, in the civilian population, suicide rates differ by *gender*; men are at much higher risk of dying from suicide than females. The same is true in the armed forces, with men making up 95 percent of the Army suicide population but 85 percent of the total Army population (Allen, Cross, and Swanner, 2005). At the same time, depression, PTSD, and TBI have a greater effect on females' than on males' risk of suicide (Henriksson et al., 1993; Oquendo et al., 2003; Teasdale and Engberg, 2001). *Race* is another demographic correlate: Although Caucasians make up 59 percent of the total Army population, they account for 71 percent of all Army suicides (Allen, Cross, and Swanner, 2005). White veterans have a three-times-greater risk of dying from suicide than non-White veterans (Kaplan et al., 2007). Suicide rates have also been associated with specific *symptoms*. For example, a psychological autopsy study of suicides occurring during a major depressive episode found that suicides were less likely to express symptoms of fatigue, difficulties concentrating, or indecisiveness, and that only insomnia was an immediate indicator of risk (McGirr et al., 2007).

*Different types* of TBI have also been differentially linked with suicide; among persons with TBI, those with cerebral contusions or traumatic intracranial hemorrhage have higher rates than those with concussions or cranial fractures (Teasdale and Engberg, 2001). Symptom *severity* also matters. For example, higher levels of PTSD symptoms are associated with increased levels of suicide ideation (Marshall et al., 2001). For TBI, the length of an individual's hospital stay, a proxy for injury severity, increased the risk of a subsequent suicide (Teasdale and Engberg, 2001). *Nonfatal suicide attempts* are the strongest predictors of subsequent fatal suicides, even when controlling for past mood disorders, such as depression (Harris and Barraclough, 1997; Joiner et al., 2005). Among people with depression, PTSD, and TBI, suicide risk is also elevated among those with *substance use disorders* (Mills et al., 2006; Simpson and Tate, 2005; Waller, Lyons, and Costantini-Ferrando, 1999). In their empirical review, Wilcox, Conner, and Caine (2004) found that, with respect to suicide, the standardized mortality ratio for substance use disorders was 9 to 14 times higher than it was for those without these disorders, and variation was due to the specific substance under study (e.g., alcohol use disorders versus opioid drug use).

Among servicemembers specifically, *combat exposure* increases the risk of suicide. For example, Vietnam veterans face an increased risk of suicide mortality relative to non-Vietnam veterans, especially during the first five years after discharge from active duty (Boehmer et al., 2004). Additionally, mortality rates from external causes, which include suicide, were higher among Vietnam theater veterans with PTSD than among Vietnam theater veterans without PTSD (Boscarino, 2006a and 2006b). One study of veterans with PTSD found that it was not any particular PTSD symptom or cluster of

symptoms, but rather combat-related guilt, that was the strongest predictor of suicidal behavior (Hendin and Haas, 1991).

### **Physical Health and Mortality**

There are strong relationships between physical health and mental well-being. In some cases, physical symptoms are consequences of mental conditions. For example, insomnia may be a symptom of depression, or headaches may be symptoms of TBI. Alternatively, physical impairment may lead to mental impairment as a result of limitations in occupational or social functioning, which may foster increased reliance on others to perform basic tasks and compromised access to medical care. Mental health symptoms may also contribute to poor physical health through altered biological functions (e.g., decreased immune function) or by influencing individual health risk behavior (e.g., smoking, poor diet).

**Mortality.** Persons with depression face an increased risk of death relative to their similarly aged counterparts without depression (Wulsin, Vaillant, and Wells, 1999). In one study of Army veterans conducted 30 years after service, total mortality was higher among those with PTSD who served in theater than among those who served in theater but did not have PTSD (Boscarino, 2006b). The increased risk of death among persons with PTSD and depression appears to be driven by two primary causes: increases in the risk of death from unnatural causes (e.g., homicide, suicide, and unintentional injuries) and from cardiovascular disease. For the sample of Army veterans, combat veterans with PTSD had elevated risks of cardiovascular mortality, external-cause mortality, and cancer mortality relative to combat veterans without PTSD (Boscarino, 2006a). However, there is no evidence of an increased risk in cancer-related mortality among persons with depression.

The effect of TBI on mortality may be the most pronounced because these injuries can, in and of themselves, be life-threatening. In 1992, among military personnel with a medical discharge record indicating a TBI diagnosis, the reason for discharge from the military was more likely to be coded as “death” relative to the entire military discharged population without TBI. As would be expected, the likelihood of reason for discharge being death increased with injury severity: Persons with a mild TBI were 11.6 times more likely and servicemembers with a severe TBI diagnosis were close to 150 times more likely to have the reason for discharge coded as “death” (Ommaya et al., 1996b).

**Morbidity.** Cardiovascular diseases, particularly coronary heart disease (CHD), which includes myocardial infarctions (MIs), or heart attacks, are the most frequently studied morbidity outcome among persons with psychiatric disorders. In a meta-analysis, Rugulies (2002) found that persons who met probable diagnostic criteria for depression were nearly two times more likely to develop both fatal and non-fatal CHD than persons without depression. Research also documents a relationship between PTSD and CHD (Bankier and Littman, 2002; Boscarino and Chang, 1999;

Falger et al., 1992; Solter et al., 2002). In a prospective study of this relationship among men who had at one point served in the military, increasing levels of PTSD symptoms were associated with an increased risk of all CHD outcomes (i.e., nonfatal MI, fatal CHD, and angina), and specifically with nonfatal MI and fatal CHD (Kubzansky et al., 2007). Very little research has investigated cardiovascular outcomes after TBI.

With respect to physical non-heart-related morbidities, combat Vietnam veterans with PTSD had a greater number of unspecified physician-rated medical complaints than those without PTSD (Beckham et al., 1998). There is also evidence that depression directly affects conditions associated with aging, including osteoporosis, arthritis, Type 2 diabetes, certain cancers, periodontal disease, and frailty (Kiecolt-Glaser and Glaser, 2002). Finally, patients with TBI endure physical injuries that can include pulmonary dysfunction, cardiovascular dysfunction, gastrointestinal dysfunction, fluid and hormonal imbalances, and fractures, nerve injuries, blood clots, or infections (National Institute of Neurological Disorders and Stroke, 2002). As the severity of TBI increases, the rate and severity of physical health consequences do as well (National Institute of Neurological Disorders and Stroke, 2002). In the long-term, individuals with TBI may also be more likely to experience Alzheimer's disease, Parkinson's disease, and other disorders more specific to the cause of trauma (e.g., repetitive blows for boxers) or its severity (e.g., brain injury that results in coma) (National Institute of Neurological Disorders and Stroke, 2002).

**Self-Reported Medical Symptoms.** Deployed servicemembers report high levels of somatic complaints during deployment: In a survey of over 15,000 deployed military personnel, 77 percent of personnel deployed to Iraq and 54 percent of those deployed to Afghanistan experienced diarrhea (often associated with fevers and vomiting), 69 percent reported a respiratory illness, and 35 percent reported noncombat injuries (Sanders et al., 2005). When asked about their own health, persons with PTSD, depression, and TBI are consistently more likely to endorse physical problems than those without these disorders. Among servicemembers assessed one year after returning from Iraq, those who met probable diagnostic criteria for PTSD were more likely than soldiers who did not screen positive for PTSD to report being bothered by a variety of physical symptoms, including stomach pain, back pain, pain in the limbs, headaches, chest pain, dizziness, fainting spells, pounding or racing heart, shortness of breath, bowel symptoms, nausea, and pain or problems during sexual intercourse (Hoge et al., 2007). Soldiers in this study screening positive for PTSD were also more likely to rate their health as poor or fair and to report making sick calls or missing workdays. All of these associations remained even after controlling for suffering an injury during combat. Studies among both veteran and civilian populations have shown similar results (Beckham et al., 1998; Breslau and Davis, 1992; Dobie et al., 2004; Lauterbach, Vora, and Rakow, 2005). Soldiers with mild TBI, assessed three to four months after their return from Iraq, also reported significantly poorer general health and greater somatic symptoms than soldiers without TBI, but these associations were eliminated after control-

ling for concurrent PTSD and depression (Hoge et al., 2008). This situation suggests that PTSD and depression may be important mediators of the effects of TBI on general physical health, although these results still await replication.

**Quality of Life/Physical Functioning.** Across studies, individuals with PTSD report lower quality of life and well-being than those without PTSD. For example, in clinical samples of veterans (Magruder et al., 2004; Schnurr et al., 2006) and community-based samples of Vietnam veterans (Zatzick et al., 1997), higher levels of PTSD symptoms are associated with lower levels of physical functioning. A recent study of 120 service-members who enrolled for health care after returning from OEF and OIF similarly found that self-reported health, emotional well-being, and energy were all significantly lower among those with PTSD than among those without the diagnosis (Erbes et al., 2007). Similar patterns of relationships exist for depression (Wells et al., 1989). The mechanism underlying cross-sectional relationships between these constructs remains unclear. In one of the few longitudinal studies of these relationships, there was evidence that self-rated overall health among older adults has a modest effect on depressive symptoms, but that depressive symptoms have very little effect on self-related health (Kosloski et al., 2005). The study of quality of life and physical functioning after TBI is relatively undeveloped. Most studies of functional outcomes after TBI occur during or after a rehabilitation program and indicate general improvement in these outcomes as the time from the injury increases; for example, among patients with severe TBI, there was general improvement across a variety of functional dimensions one year after the injury, signaling improvement (Lippert-Gruner et al., 2007).

**Health-Compromising Behaviors.** The link between negative physical health outcomes and PTSD, depression, and TBI may partially be explained by increases in other types of health-risk behaviors that are known to influence health outcomes as well. For example, there is a clear link between most psychiatric disorders, including PTSD and depression, and smoking. Cross-sectional analyses of the National Comorbidity Survey reveal that persons who met criteria for depression or PTSD at any point in their lives and in the past 30 days were more likely to be lifetime and current smokers than were persons without a mental disorder (Lasser et al., 2000). Samples of military veterans have found similar associations between smoking and PTSD (Buckley et al., 2004; Dobie et al., 2004). Studies also indicate unique smoking-related outcomes in PTSD and depression. For example, exposure to trauma and the development of PTSD increases smoking frequency (Feldner, Babson, and Zvolensky, 2007). In addition, some evidence suggests that persons with PTSD have harder times quitting smoking, although depressive symptoms do not appear to affect rates of cessation (Feldner, Babson, and Zvolensky, 2007; Kinnunen et al., 2006). In addition, mental health symptoms may also impact other health-compromising behaviors that increase the risk for adverse health outcomes. For example, symptoms of depression and PTSD increase sexual-risk-taking behaviors that, in turn, increase the risk of sexually transmitted infections, including HIV (Holmes, Foa, and Sammel, 2005). Among people

with depression (Simon et al., 2006) and PTSD (Vieweg et al., 2006a, 2006b), epidemiological studies also reveal an elevated prevalence of obesity.

### **Substance Abuse**

Substance use disorders often co-occur with other mental disorders. In the civilian population, about half of those with substance abuse also have a mental disorder, and about 15–40 percent of people with a mental disorder have substance abuse (Kessler, Nelson, et al., 1996; Regier et al., 1990). Individuals with substance use disorders that co-occur with other mental disorders have more-severe diagnostic symptoms, require more-specialized treatment, and have poorer treatment outcomes than individuals with a single disorder (Kessler, Nelson, et al., 1996; Watkins et al., 2001).

**Alcohol and Drug Use.** Alcohol and drug use disorders are highly prevalent among individuals with PTSD, MDD, and TBI. For PTSD, a study of Vietnam combat veterans showed that up to 75 percent of veterans with a history of PTSD in their lifetime met criteria for substance abuse or dependence (Kulka et al., 1990). Individuals in the general population with depression are 3.7 times more likely to meet alcohol-dependence criteria, 1.2 times more likely to meet alcohol-abuse criteria, 2.5 times more likely to meet drug-abuse criteria, and 9 times more likely to meet drug-dependence criteria (Grant et al., 2004). Finally, about 79 percent and 37 percent of individuals with traumatic brain injury met criteria for alcohol and drug use disorders, respectively (Taylor et al., 2003).

Several studies have attempted to discern the temporal relationship between mental disorders and alcohol and drug misuse, but to date the results have been mixed, depending on the specific disorder studied. For example, reviews of the literature on substance abuse and PTSD (Jacobsen, Southwick, and Kosten, 2001; Stewart, 1996) found most support for the *self-medication hypothesis*, which suggests that PTSD increases the risk of substance use disorders because individuals use substances to cope with their PTSD (Chilcoat and Breslau, 1998). According to Bremner and colleagues (1996), Vietnam combat veterans reported that alcohol, heroin, benzodiazepines, and marijuana “helped” their PTSD symptoms, although cocaine tended to worsen hyper-arousal symptoms further, supporting the self-medication theory that substances may be used to relieve distressing PTSD symptoms. In contrast, models examining the relationship between depression and substance use suggest that depression and negative affect are a consequence of substance use rather than a cause (Swendsen and Merikangas, 2000). Even small amounts of alcohol use are associated with an increased prevalence of depression and poorer treatment outcomes, as well as increased morbidity, mortality, and disability (Rehm et al., 2003; Stinson et al., 1998; Sullivan, Fiellin, and O’Connor, 2005; Worthington et al., 1996).

Substance use and TBI co-morbidity has been specifically associated with military discharge. Compared with all those discharged from the military, persons with mild TBI were over two times more likely to be discharged for alcohol/drugs or crimi-

nal convictions, and persons with moderate TBI were about five times more likely to be discharged for alcohol/drug problems (Ommaya et al., 1996a). Additional consequences associated with TBI and substance use included lower likelihood of returning to work, decreased life satisfaction, greater risk of continued abuse post-injury, and that continued drinking post-injury perpetuated these consequences (Taylor et al., 2003).

To the extent that mental disorders related to military service predict subsequent drug use, there are likely to be wide-ranging implications for servicemembers, because even short-term drug use during military service has long-term consequences. One study examined the mortality of 1,227 Army male returnees 25 years after returning from Vietnam (Price et al., 2001). Compared with both civilian counterparts and non-drug-using Vietnam returnees, veterans who continued using opiates after the Vietnam War were more likely to experience premature death (Price et al., 2001). Short-term drug use has also been associated with alcohol abuse (Boscarino, 1981; O'Brien et al., 1980), depressive symptoms (Helzer, Robins, and Davis, 1976; Nace et al., 1977), and poor social adjustment (Mintz, O'Brien, and Pomerantz, 1979).

**Tobacco Use.** Despite public health efforts to reduce the prevalence of tobacco use, smoking is still the leading preventable cause of morbidity and mortality in the general population (United States Department of Health and Human Services, 1990) and is a considerable problem for the U.S. military, costing an estimated \$952 million per year (Robbins et al., 2000). Research has shown that smoking is associated with disability, decreased productivity, increased absenteeism, and longer and more-frequent work breaks among Department of Defense personnel (Helyer, Brehm, and Perino, 1998). Klesges and colleagues (2001) found that Air Force recruits who smoke cost the U.S. military an additional \$18 million per year in training costs; when applied to all branches of the military, the attitudes and behaviors associated with smoking status (which contribute to early discharge) cost the military an estimated \$130 million per year in excess training costs (Klesges et al., 2001).

Recent research has indicated that tobacco use may also be associated with mental health behaviors and outcomes. For example, Shalev, Bleich, and Ursano (1990) found that Vietnam veterans with PTSD had a greater incidence of smoking than those without PTSD. Another study found similar rates of smoking among those with and without PTSD, but a higher prevalence of *heavy* smoking among those with PTSD than among those without (Beckham et al., 1997). For instance, McClernon and colleagues (2005) found that smokers with PTSD had higher puff volumes than smokers without PTSD. One study of civilians in southeast Michigan found a significantly increased risk of nicotine dependence in individuals exposed to trauma without the presence of PTSD; the risk was even greater among those with exposure to trauma and the presence of PTSD (Breslau, Davis, and Schultz, 2003). While the above studies do not provide causal evidence that PTSD leads to unhealthy smoking behaviors, they do suggest an association between the two.

Several studies have suggested that tobacco use may alleviate some symptoms of mental disorders, such as PTSD and depression. McFall, Mackay, and Donovan (1992) suggested that the association between PTSD and smoking may indicate the utilization of nicotine to alleviate PTSD symptoms of arousal, numbness, or detachment. Indeed, Beckham et al. (1997) found that heavy-smoking status was associated with hyperarousal and avoidance symptoms, as well as with general PTSD symptoms. Thorndike and colleagues (2006) found that severity of nicotine dependence was positively correlated with total PTSD symptoms, hyperarousal symptoms, and avoidance symptoms; this correlation remained after controlling for depression vulnerability.

Similar hypotheses have been generated with regard to major depression: In a prospective study, Breslau et al. (1998) found that those with a history of major depression were more likely to become daily smokers, suggesting possible self-medication of depressive symptoms. The researchers also found that a history of daily smoking at baseline increased the risk for major depression.

**Correlates and Moderators.** Men and women may experience stressors differently and may experience different vulnerabilities to substance use and co-occurring PTSD, MDD, and TBI. Men with PTSD are more likely to have alcohol abuse and dependence; women may be at greater risk for co-morbid depression rather than alcohol-abuse dependence (Jacobsen, Southwick, and Kosten, 2001). Additionally, the association between nicotine dependence and PTSD symptoms is stronger among men than women (Thorndike et al., 2006), although rates of substance abuse among women veterans with PTSD remain high (Dobie et al., 2004). Alcohol use is also greater and the consequences of alcohol use more severe among soldiers with less education, ethnic minority groups, males, those not in an intimate relationship, enlisted members, and those deployed in the United States (Gutierrez et al., 2006).

**Summary.** Co-occurring substance use disorders with PTSD, MDD, and TBI are common and are often associated with more-severe diagnostic symptoms and poorer treatment outcomes. These findings suggest that individuals with substance abuse comorbidity may be more difficult to treat and may present more challenging and unique sequelae in treatment (Ouimette, Brown, and Najavits, 1998). It appears that substance use often results from PTSD and often precedes depression, and that this temporal understanding can help shape treatment programs to identify the risk factors associated with each of those conditions.

### **Labor-Market Outcomes: Employment and Productivity**

The effect of mental health on employment outcomes in the military population requires an understanding of the structure of the military itself and of servicemembers' experiences in both the military and civilian labor force. Servicemembers from the Active Component perform full-time duty in a uniformed Service. Members of the Reserve Component, on the other hand, perform a minimum of 39 days of service per year and augment the active duty military, and may also hold jobs in the civilian

labor force. There are active duty Reserve Component servicemembers who work full-time for their Service Reserve Component, yet who are considered reservists. However, these make up a small percentage of the total Reserve force. Upon redeployment from service, members of both the Active Component and Reserve Component may return to the same employment status they held prior to deployment. Alternatively, they may switch—i.e. members of the Reserve Component may transfer to the Active Component or vice versa—or they may separate from military service. If they separate, they may pursue employment opportunities in the civilian labor market or may be unemployed.

**Employment.** Studies of the effect of PTSD on current employment status have been conducted primarily on Vietnam veterans. Collectively, these studies indicate that veterans with PTSD are less likely to be currently employed than veterans without the disorder (McCarren et al., 1995; Savoca and Rosenheck, 2000; Smith, Schnurr, and Rosenheck, 2005; Zatzick et al., 1997). For example, Zatzick and colleagues (1997) found that veterans with a current probable PTSD diagnosis were over three times more likely to report currently not working relative to veterans without PTSD, even after adjustment for demographic characteristics and co-morbid conditions. Smith and colleagues (2005) extended these findings by showing that, among a sample of veterans receiving treatment for PTSD symptoms, as severity of these symptoms increased, the likelihood of both full-time and part-time work decreased.

Savoca and Rosenheck (2000) studied the effect of depression on employment among veterans, finding that a lifetime diagnosis of major depression was inversely associated with the probability of current employment. Similar findings have been shown in nationally representative studies of the civilian population. Both men and women with current depression are less likely to be employed than other civilian counterparts without the disorder (for men, 87 percent of those with major depression were employed as opposed to 93.3 percent of those without depression; for women, the prevalence of employment was 74 percent among those with depression and 82 percent for those without) (Ettner, Frank, and Kessler, 1997).

Whereas studies of employment outcomes for persons with PTSD and depression have generally relied on population-based samples, research on such outcomes after TBI have relied primarily on clinical samples of persons with brain injuries who may receive neurotrauma services and rehabilitation. A brain injury usually occurs in the context of an accident or injury at a discrete point in time, and research has thus generally investigated the proportion of employed persons who *return to work* after their injury. Data from one national database indicate that close to 60 percent of individuals with TBI are successfully rehabilitated and that of those, approximately 90 percent went on to be employed in the competitive labor market (Wehman et al., 2005). Among one sample of military personnel entering an eight-week clinical rehabilitation trial for moderate-to-severe closed head injury, over 90 percent were employed one year post-injury, and roughly three-quarters were deemed fit for duty (Salazar et al., 2000).

The probability of employment increases with less-severe injuries, shorter coma times, and shorter periods of rehabilitation (Wehman et al., 2005). In addition, the degree of impairment caused by the injury, pre-morbid employment factors (including educational level, occupational category, and job satisfaction), social and familial supports, and sociodemographic characteristics have all been associated with return-to-work outcomes (Wehman et al., 2005).

**Productive Work: Absenteeism and Presenteeism.** Poor mental health is associated with individuals' lower likelihood of employment, but it may also affect the performance of individuals who are or remain employed. Measures of productive work fall under two categories—absenteeism and presenteeism. *Absenteeism* reflects the number of lost workdays and has been measured by the number of sick days, missed workdays, or hours worked per week. *Presenteeism* generally refers to lost productivity at work and can be measured by individuals' reports of their level of focus on a task and productivity or performance while at work.

Studies of absenteeism in relation to mental health have focused overwhelmingly on depression. When workers are asked to recall the hours that they work, there is scant evidence of reduced work hours among those with depression compared with workers without these disorders, in either civilian or veteran populations (Ettner, Frank, and Kessler, 1997; Savoca and Rosenheck, 2000). However, studies that have used administrative data, which is less subject to self-report biases, find evidence of increased levels of absenteeism among individuals with depression. For instance, depressed workers in the civilian population have more short-term work-disability days than nondepressed workers (Kessler, Barber, et al., 1999). In another nationally representative sample (the American Productivity Audit/Depressive Disorders Study), workers with depression reported, on average, missing one hour per week due to absenteeism versus an expected loss of 0.4 hour per week in the absence of depression. The estimated costs of depression to the U.S. economy through lost productivity range in the billions of dollars (Greenberg et. al., 2003).

In comparison, there have been few studies of absenteeism among persons with PTSD and TBI, although we can glean some information from studies of military personnel. For instance, in a sample of active duty troops one year after returning from deployment to Iraq, those with PTSD were significantly more likely to report missing two or more workdays in the past month relative to redeployed soldiers without PTSD (Hoge et al., 2007). With respect to TBI, Ommaya et al. (1996b) examined one year of military hospital discharge data linked to military service discharge data and found that increases in the severity of head injuries corresponded with increases in total sick days. A recent survey of 2,525 soldiers collected three to four months after returning from Iraq similarly found that those reporting mild TBI also reported more missed workdays than those without TBI (Hoge et al., 2008).

Studies of presenteeism are rare; those that do exist tend to focus on depression. In a study that asked respondents to recall their work performance in the past two

weeks across six work-related dimensions, those with depression lost on average 4.6 hours per week for presenteeism, which was significantly higher than the expected loss of 1.5 hours per week (Stewart et al., 2003). Although we found no observational studies relating PTSD or TBI to levels of work productivity, there is evidence to suggest that both PTSD and TBI are linked to lower levels of productivity. For instance, under experimental conditions, veterans with PTSD and patients with moderate-to-severe TBI are less attentive to common work tasks, particularly in the absence of distractions (Chemtob et al., 1999; Whyte et al., 2000). On the other hand, under experimental conditions, there was no indication that police recruits with PTSD performed worse during stressful situations than control recruits without PTSD (Leblanc et al., 2007). Thus, although evidence suggests that PTSD and TBI may impair work-related performance, the degree to which deficits in functioning are clinically relevant remains to be determined.

**Wages and Income.** There is evidence linking psychiatric disorders with decreased wages. For instance, among Vietnam veterans, both depression and PTSD had negative effects on hourly wages. More specifically, veterans suffering from PTSD had 16 percent lower hourly wages than veterans who do not, and those with depression had 45 percent lower hourly wages than veterans who do not (Savoca and Rosenheck, 2000). Wages are even lower for veterans with depression and a co-morbid substance-use disorder (Savoca and Rosenheck, 2000). However, a clinical study of veterans receiving treatment for PTSD found no evidence that severity of PTSD was related to monthly earnings (Smith et al., 2005). Results from the National Comorbidity Survey indicate that there may be a significant reduction in the earnings of men and women with any disorder, although not specifically for depression (Ettner, Frank, and Kessler, 1997). Among one sample of TBI rehabilitation patients, average mean income declined 48 percent per month one year after incurring the injury (Johnstone, Mount, and Schopp, 2003). Finally, using data from the American Community Survey, Gamboa and colleagues (2006) estimated the full economic consequences of having a cognitive disability lasting six months or more and found that those with such a disability earned, on average, \$10,000 less than persons without such a disability. These differences, however, varied by highest level of education, with larger differences among those with higher levels of educational attainment.

**Education.** Although there are education requirements for entering the U.S. military service, many servicemembers may desire to continue their education by pursuing post-secondary schooling or graduate school. Previous studies indicate that achieving these educational goals has significant effects on a variety of outcomes, including occupational achievement, financial security, and health (Kessler, Foster, et al., 1995). Having PTSD, depression, or TBI is likely to affect how successful servicemembers will be at obtaining these future educational goals. Accounting only for mental disorders that occurred before terminating their schooling, beginning in high school, persons in the National Comorbidity Survey with one or more mental disorders were

consistently more likely to terminate their education than those without a disorder. However, among persons who completed eighth grade, persons with mood disorders (which include depression) and anxiety disorders (which include PTSD) were less likely to complete high school; high school graduates were less likely to enter college, and college entrants were less likely to complete college (Kessler, Foster, et al., 1995).

**Summary.** PTSD, depression, and TBI all influence labor-market outcomes. Specifically, there is compelling evidence indicating that these conditions will affect servicemembers' return to employment, their productivity at work, and their future job prospects, as indicated by impeded educational attainment. However, these findings should be interpreted cautiously. The majority of those studies referenced above are cross-sectional; it is not yet clear that these mental conditions are underlying causes of the observed labor-market outcomes. In fact, working has many benefits in and of itself, ranging from enhancing social interactions to promoting self-esteem and expanding economic self-sufficiency (Wehman et al., 2005). Thus, poor performance in the workplace can influence the development of mental health symptoms or enhance symptoms that may already exist.

### **Homelessness**

The Department of Veterans Affairs has identified over 1,000 veterans coming back from Afghanistan and Iraq as at risk for homelessness and has served about 3,000 in its homelessness programs (Perl, 2007). Psychiatric symptoms and substance use have been described as the primary risk factors for homelessness among veterans (Rosenheck et al., 1996). Studies of veterans indicate that psychiatric symptoms and substance use were stronger predictors of homelessness than combat exposure or any other military factor (Rosenheck and Fontana, 1994). Other veteran and civilian studies support the strong risk that mental health problems and substance use has for homelessness (Robertson, 1987; Roth, 1992). For instance, research from the National Vietnam Veterans Readjustment Study indicates that those who experienced stress in a war zone had more readjustment problems and that stress and readjustment problems were stronger predictors of homelessness than exposure to war zones alone (Kulka et al., 1990). Similarly, adverse effects of PTSD, including substance abuse, interpersonal difficulties, and unemployment, were associated with veterans' homelessness (Rosenheck, Leda, and Gallup, 1992). As for nonveteran populations, extreme poverty and social isolation are also risk factors for homelessness (Rosenheck, Kaspro, and Seibyl, 2004).

**Mental Health and Homelessness.** Few studies have examined the rates of homelessness among individuals with PTSD, MDD, or TBI. One study that has examined this relationship to some degree found that about 15 percent of individuals seeking mental health services in San Diego over one year were homeless; a severe mental disorder and poorer functioning were the greatest risk factors (Folsom et al., 2005). In a smaller New York study, rates of homelessness among a mental health treatment

population were about 19 percent within three months of admission, 25 percent within three years, and 28 percent in their lifetime (Susser, Lin, and Conover, 1991).

Instead, the literature on homelessness has tended to focus on the reverse relationship—i.e., examining the prevalence of mental disorder among homeless populations. Compared with nonhomeless persons in the general population, homeless people have increased rates of mental disorder, including substance use (Breakey, 2004) and traumatic brain injury (Gonzalez et al., 2001). Homeless persons are also more likely to experience a severe mental disorder, such as schizophrenia, chronic depression, and bipolar depression (Susser et al., 1997). It is unclear whether mental disorders cause homelessness, or whether being homeless increases the risk of developing such conditions. Most research suggests the former, that mental disorders and dysfunction are risk factors for homelessness (Muñoz et al., 1998; Backer and Howard, 2007). In one study, about 75 percent of individuals with PTSD developed the diagnosis prior to becoming homeless (North and Smith, 1992), suggesting that a mental disorder may be a precursor to homelessness. Other risk factors that contribute to homelessness include poverty, disaffiliation, and personal vulnerability—each of which is overrepresented among persons with a severe mental disorder (Breakey, 2004).

The prevalence of mental disorders among homeless people may be overstated and may be the consequence of studies relying on poor sampling methods or research guided by the assumption that homelessness is caused by personal faults (e.g., inability of some persons to care for themselves) (Koegel, Burnam, and Baumohl, 1996). In fact, an integrated perspective on homelessness highlights that personal limitations (mental health, lack of support) interact with structural factors (low availability of low-cost housing, decreased resources for the vulnerably poor) to enhance the likelihood of homelessness (Koegel, 2004; Koegel, Burnam, and Baumohl, 1996).

**Consequences of Mental Health and Homelessness.** Compared with homeless people without mental disorders, homeless people with mental disorders have worse physical health; difficulty with subsistence needs, such as finding shelter, food, and clothing; victimization; and quality of life (Sullivan et al., 2000). Homeless veterans with depression are more than two times more likely to report fair or poor health than homeless veterans without depression (Nyamathi et al., 2004). Homeless men and women with depression or schizophrenia are at the greatest risk of victimization (physical and sexual assault); symptoms related to these disorders may decrease vigilance for danger or place those who have a disorder at greater observable risk to the community (Wenzel, Koegel, and Gelberg, 2000).

### **Marriage and Intimate Relationships**

The effects of post-combat mental and cognitive conditions inevitably extend beyond the afflicted servicemember. As servicemembers go through life, their impairments cannot fail to wear on those with whom they interact, and those closest to the servicemember are likely to be the most severely affected (Galovski and Lyons, 2004). Indeed,

a broad empirical literature has documented the range of negative consequences that post-combat mental disorders have had on the families of servicemembers returning from prior conflicts.

In general, research on the consequences of mental disorders for families has identified direct and indirect routes through which these consequences come about. In the direct route, the specific interpersonal deficits suffered by servicemembers have immediate effects on their loved ones and family members—e.g., difficulties with emotion regulation, which is a predictor of greater risk of physical violence in the home. In the indirect route, the other direct consequences of a servicemember's disorder (e.g., the inability to sustain employment) themselves have negative consequences for the servicemember's family (e.g., financial hardship, deprivation).

**Consequences for Intimacy and Relationship Satisfaction.** The cognitive and emotional deficits associated with PTSD, depression, and TBI inhibit activities crucial to maintaining intimacy in a relationship (Carroll et al., 1985). Successful intimacy requires that partners be capable of experiencing and expressing emotion, understanding and providing for each other's needs, and recognizing (and at times restraining) their own impulses. Mental disorders, whether psychological or neurological, interfere with all of these behaviors, leading to serious and negative consequences for intimate relationships. Within military populations, these sorts of effects have been documented most thoroughly with respect to PTSD. For example, MacDonald et al. (1999), in a study of Vietnam veterans living in New Zealand, asked 756 individuals about their combat experience, symptoms of PTSD, and intimate and family relationships. Those with higher levels of PTSD symptoms reported greater interpersonal problems (e.g., difficulties expressing intimacy, lack of sociability), and poorer marital and family relationships as well. Moreover, interpersonal problems were found to mediate the associations between PTSD and the quality of family relationships. That is, PTSD symptoms were directly associated with specific interpersonal deficits in these veterans, and those deficits appeared to account for the links between PTSD and impaired family relationships (see also Riggs et al., 1998). Studies such as these join an extensive literature that has linked PTSD with difficulties maintaining emotional intimacy (Jordan et al., 1992) and with greatly elevated risk of divorce (Kessler, Walters, and Forthofer, 1998; Kulka et al., 1990).

The effects of depression and TBI on emotional intimacy and relationship satisfaction have not been studied as extensively in military populations per se. However, the interplay between depression and marital relationships is one of the most thoroughly studied topics in marital research on civilian populations. Among other findings, this research has revealed that, compared with nondepressed individuals, depressed individuals are poorer at resolving marital conflicts (Du Rocher Schudlich, Papp, and Cummings, 2004; Hautzinger, Linden, and Hoffman, 1982), poorer at soliciting for and providing their partners with social support (Davila et al., 1997), more likely to blame their partners for negative behaviors (Fincham, Beach, and Bradbury, 1989), and more

likely to seek excessive reassurance of their worth (Joiner and Metalsky, 1995). Perhaps as a consequence, after interacting with their depressed partners, intimates and spouses of these individuals are likely to experience negative emotions, such as anger and sadness (Kahn, Coyne, and Margolin, 1985). It is not surprising, then, that major depression and depressive symptoms are strongly linked to lower levels of marital satisfaction and higher rates of marital distress, both cross-sectionally (Whisman, 2001) and longitudinally (Davila et al., 2003), and higher risk for divorce as well (Kessler, Walters, and Forthofer, 1998).

The scant research on TBI in civilian populations paints a similar picture. For example, a study of 65 couples in which just over half of the husbands had experienced a brain injury found that, relative to men without a brain injury, the injured reported more difficulties resolving conflict in their marriages (Kravetz et al., 1995). There is no reason to believe that the processes through which depression and TBI damage these relationships should differ between military and civilian couples.

**Consequences for the Well-Being of Spouses and Partners.** In addition to the direct effect of PTSD, depression, and TBI on emotional intimacy, these impairments also represent a substantial, and usually unexpected, caregiving burden. Most often, it is the intimate partner or spouse who bears this burden. Figley (1993), writing specifically about the wives of Vietnam veterans with PTSD, suggested that the stress of caring for a loved one with a mental disorder can result in *secondary traumatization*—i.e., a situation in which the intimate partners of trauma survivors themselves begin to experience symptoms of trauma. Figley initially applied this term restrictively, referring only to spouses who develop stress reactions (e.g., nightmares, intrusive thoughts) to specific events that their partners had experienced. Later writers (Galovski and Lyons, 2004) expanded the use of this term to refer more broadly to any distress experienced by those close to a traumatized individual.

With respect to PTSD, there is extensive evidence that secondary traumatization, at least in its broader sense, occurs and has serious negative consequences for the emotional and psychological well-being of the spouses of veterans with PTSD (Dirkzwager et al., 2005; Verbosky and Ryan, 1988). An extensive program of research on the wives of Israeli soldiers traumatized during that country's 1982 war with Lebanon supports the idea that the more symptoms of PTSD reported by the veteran, the greater the caregiving burden reported by their wives, and the more likely that their wives also experienced anxiety and dysphoria (Solomon et al., 1992a, 1992b). It is worth noting that other family members are not equally at risk for secondary traumatization. A study of the wives and parents of Dutch peacekeepers found that higher levels of PTSD symptoms in peacekeepers were associated with higher levels of psychological symptoms in their wives, but had no relationship to symptoms in their parents (Dirkzwager et al., 2005). Thus, the brunt of the burden of servicemembers with PTSD appears to fall on the people who are most intimate with those individuals—their wives.

With respect to depression, the civilian literature that we reviewed shows that depression in one partner predicts declines in relationship quality and increased risk for divorce among married couples. The same literature has also shown that depression in one partner can lead to depressive moods in the other partner, increasing the risk of a depressive episode in that partner (Joiner and Coyne, 1999).

With respect to TBI, Ben Arzi, Solomon, and Dekel (2000) compared psychological symptoms in wives of veterans with post-concussion syndrome (similar to TBI), wives of veterans with PTSD, and wives of veterans without a diagnosis. Compared with the wives of the healthy veterans, wives of veterans with either of the disorders experienced significantly higher levels of distress and psychiatric symptoms. Thus, whether a servicemember experiences a trauma that is psychological or neurological, the trauma's negative effects appear to spread to the intimate partners.

**Implications for Intimate-Partner Violence.** In addition to their problems expressing positive emotions and experiencing intimacy, returning servicemembers suffering from mental disorders report problems restraining negative emotions, especially anger and aggression. After the Vietnam War, for example, veterans residing at the Northport Veterans Administration Medical Center in New York described managing anger as one of their most challenging issues (Blum et al., 1984). Chemtob et al. (1997) have suggested that deficits in regulating anger should be especially prevalent among veterans with PTSD. According to their conceptual framework, in veterans with PTSD the experience of traumatic events during combat leads to a chronic and excessive sensitivity to threats, even after returning from combat, and to a corresponding tendency to respond to perceived threats with hostility. Survey research on veterans with PTSD confirms that veterans with PTSD experience higher levels of anger than nonveterans with PTSD or veterans with other psychiatric diagnoses (Chemtob et al., 1994).

Among Vietnam veterans who have sought treatment for PTSD, rates of violence and abuse within their marriages are distressingly high. For example, Williams (1980) found that 50 percent of veteran couples seeking treatment reported physical aggression within their households. Studies that have compared veterans with PTSD with veterans seeking treatment for other reasons have further found that those with PTSD report higher rates of domestic violence than those with other diagnoses (Carroll et al., 1985). A more representative survey of 1,200 male Vietnam veterans reached similar conclusions: Those with higher levels of PTSD symptoms were more likely than other groups to engage in violent behavior within the home (Jordan et al., 1992).

As with the literature on PTSD, research on the implications of depression for intimate-partner violence has mostly addressed samples of couples seeking treatment, either for depression or for marital discord. For example, Boyle and Vivian (1996) examined nonviolent, moderately violent, and severely violent men seeking marital therapy with their wives and compared them with community males who were not seeking therapy. Controlling for other, related factors, such as relationship discord and problem-solving ability, levels of depressive symptoms were positively associated with

degree of violent behavior toward the female partner, such that the most severely violent husbands reported the highest levels of depression. The most prominent study of depression and intimate-partner violence within military populations is a survey of 11,870 White males randomly sampled from Army bases between 1989 and 1992 (Pan, Neidig, and O’Leary, 1994). Controlling for demographic variables such as age and income, depressive symptoms were associated with rates of aggression against a female partner. The size of this association was substantial: Each 20-percent increase in depressive symptoms was associated with a 74-percent increase in the likelihood of being physically aggressive. A review by Schumacher et al. (2001) found depressive symptoms to be a consistent risk factor for intimate-partner violence across multiple studies.

Everything known about the implications of TBI for intimate-partner violence comes from research on civilian populations. Within that population, a loss of impulse control and an increase in aggressive behavior are known to be direct consequences of the neurological damage associated with TBI (Kim, 2002). In direct comparisons between individuals with TBI and individuals with other injuries (i.e., spinal-cord injuries), those with TBI are indeed more verbally aggressive and angry, as rated by themselves and by their peers; however, there are no differences in rates of physical aggression (Dyer et al., 2006). The research that has linked TBI specifically to intimate-partner violence and abuse has tended to sample from men receiving treatment for abusing their partners, among whom rates of TBI are higher than in the general population (Marsh and Martinovich, 2006).

**Moderators of Effects on Relationship Outcomes.** Although PTSD, depression, and TBI appear to have negative effects on families on average, the magnitude of these effects is not the same for all families. Faced with a family member afflicted with a mental disorder, some families are more resilient than others. Two potentially important moderators have been identified in multiple studies: pre-existing vulnerabilities and the quality of the marriage.

First, several studies indicate that individuals with *pre-existing vulnerabilities*—those with less education, less supportive extended families, or a history of adjustment problems—may experience worse family outcomes than individuals without these vulnerabilities. In one of the strongest studies of these issues to date, Gimbel and Booth (1994) examined associations between combat exposure and marital outcomes in 2,101 Vietnam veterans who varied in their levels of vulnerability before serving in that conflict. Results indicated that combat exposure predicted more antisocial behavior for veterans who had experienced more school problems in childhood, and that combat predicted more symptoms of PTSD for veterans who had experienced more emotional problems in childhood. In general, these researchers concluded, “for those who come into combat with problems, the outcomes of combat are likely to be more negative than if they did not have a history of problems” (Gimbel and Booth, 1994, p. 701).

Second, the way a marriage responds to one spouse's post-combat mental disorder may depend on *the quality of the marriage* before the onset of the disorder. Research on the wives of Israeli soldiers suffering from combat-stress reactions supports this idea (Mikulincer, Florian, and Solomon, 1995). Although, on average, the wives of injured soldiers fared worse than the wives of uninjured soldiers, greater intimacy between the spouses offered a measure of protection. In general, the way intimate relationships respond to post-combat mental disorders may be analogous to the way buildings respond to earthquakes: the stronger the structure initially, the greater its ability to weather a shock.

### Parenting and Child Outcomes

As the ripple effects of servicemembers' post-combat mental disorders spread horizontally to affect their spouses, so too do they spread vertically to affect their children. In both directions, the mechanisms of the effects appear to be similar: The deficits that inhibit behaviors associated with effective intimacy also directly inhibit behaviors associated with effective parenting.

**Consequences for Parenting.** The largest survey to address associations between parenting behavior and PTSD in veterans is the National Survey of the Vietnam Generation (NSVG), the survey component of the National Vietnam Veterans Readjustment Study (NVVRS). One analysis of those data that focused specifically on the implications of post-combat PTSD for family outcomes examined responses from 1,200 male veterans (Jordan et al., 1992). Analyses revealed that men with PTSD reported significantly more problems and less satisfaction with parenting than did other veterans.

How does PTSD interfere with effective parenting? The few studies that have addressed this question highlight the fact that the heightened reactivity of veterans with PTSD can lead them to avoid intensely emotional experiences of any kind (Davidson and Mellor, 2001). Ruscio et al. (2002) directly examined the role of different clusters of PTSD symptoms in a study that conducted clinical interviews with 66 male Vietnam veterans associated with the Boston VA Medical Center. The emotional numbing and avoidance aspects of PTSD were associated with poorer parent-child relationships, even after controlling for a wide range of possible covariates, including substance abuse and degree of combat exposure. In contrast, other symptoms of PTSD (e.g., re-experiencing and hyperarousal) had no unique associations with parenting. The authors suggested that it is specifically "the disinterest, detachment, and emotional unavailability that characterize emotional numbing [that] may diminish a father's ability and willingness to seek out, engage in, and enjoy interactions with his children, leading to poor relationship quality" (Ruscio et al., 2002, p. 355).

Although no research has examined the implications of depression for parenting within military populations, an extensive literature has examined the effect of depression on parenting in civilian populations. Reviews of this literature consistently conclude that depression impairs parenting behaviors. For example, in an early review of

this area, Downey and Coyne (1990) identified 15 studies that had observed depressed mothers interacting with their children in a controlled setting (i.e., semi-structured interactions, often observed in the home, ranging from 5 to 90 minutes long). In general, these studies found that depressed mothers' interactions with their children are characterized by reduced positive affect and energy, but at the same time increased levels of hostility and irritability, relative to nondepressed mothers' interactions. A later meta-analysis of this literature further revealed that even mothers who had recovered from depression still displayed impaired parenting behaviors relative to mothers who had never been depressed (Lovejoy et al., 2000).

Subsequent studies have found that depressed parents have particular difficulty with child management and discipline, vacillating between inconsistent and ineffective discipline on the one hand and rigid and controlling behavior on the other (Cummings and Davies, 1999; Oyserman et al., 2000). The consistency of the findings in this literature across several decades and multiple reviews offers some degree of confidence that depression in a parent is likely to be associated with less-effective parenting in military populations as well.

Given that TBI is a relatively recent concern for the military, no studies have examined the effect of TBI on parenting in military populations either. However, two studies have examined the implications of TBI for parenting in civilian populations. The earliest of these located 24 families in which one parent had experienced a brain injury some time after the birth of a first child (Pessar et al., 1993). Reports from the uninjured parent described negative changes in the parenting of the injured partner. A second study compared 16 families in which one parent had experienced a TBI with 16 families in which no parent was injured (Uysal et al., 1998). Interviews with family members indicated that, relative to uninjured parents, injured parents were less engaged, less encouraging, less consistent regarding discipline, and less emotionally expressive. Both of these studies addressed small, highly selective (i.e., may not represent the whole population with TBI more broadly) samples, and so their results cannot be taken as representative of the broader civilian population, let alone the military. Nevertheless, to the extent that parenting deficits continue to be observed in civilians with TBI, it is reasonable to expect that similar deficits will be observed among injured servicemembers as well.

**Consequences for Child Outcomes.** To the extent that servicemembers' post-combat mental disorders damage their intimate relationships, their spouses and partners, and their parenting practices, these disorders are likely to have long-term effects on the development of their children (e.g., Wamboldt and Reiss, 2006). Unlike many of the other effects described in this chapter, the effects of post-combat disorders on children's outcomes are likely to be indirect rather than direct consequences of servicemembers' symptoms (Cummings et al., 2001).

With respect to PTSD, in the NSVG survey described above, 376 spouses and romantic partners of Vietnam veterans were interviewed extensively about their family

experiences, including detailed assessments of child-behavior problems (Jordan et al., 1992). Compared with the spouses of veterans without PTSD, the spouses of veterans with PTSD reported significantly greater and more-severe behavior problems in their children. Expanding the focus beyond behavior problems, Davidson, Smith, and Kudler (1989) asked 108 veterans of World War II, Korea, and Vietnam with PTSD to describe their own and their children's psychiatric experiences. Among the children of the PTSD veterans, rates of academic problems were higher, and 23 percent had received psychiatric treatment, whereas none of the children of the non-PTSD controls had received psychiatric treatment. Not surprisingly, outcomes for the children of abusive veterans are especially negative (Rosenheck and Fontana, 1998).

The implications of a parent's depression on children's outcomes has not been studied directly within military populations, but it has been studied extensively in civilian populations. The results of this research have been clear and consistent across numerous studies: The children of depressed parents are at several times greater risk for behavioral problems, psychiatric diagnoses, and academic disruptions than children of nondepressed parents (Beardslee et al., 1983; Beardslee, Versage, and Gladstone, 1998; Cummings and Davies, 1999). Although the negative associations between parental depression and children's well-being are beyond dispute, the explanations for these associations remain a topic of ongoing debate. At issue is the extent to which parental depression can be viewed as a cause of behavioral, emotional, and academic problems in children or merely a symptom of other factors that cause both depression in parents and maladjustment in children. Future research may reveal that genetically vulnerable servicemembers are the ones most likely to experience post-combat depression, and that processes in military families help to transmit problems to children.

Finally, the model described in this part strongly suggests that a TBI in a parent will have negative implications for child development. To date, however, the cross-generational effects of TBI have yet to be studied.

**Summary.** Populations suffering relatively high rates of PTSD, depression, or TBI are likely to demonstrate relatively high rates of family difficulties as well. Each of these disorders has been linked independently to difficulties maintaining intimate relationships, and these deficits account for a greatly increased risk of distressed relationships, intimate-partner violence, and divorce among those afflicted. In addition, the interpersonal deficits that interfere with emotional intimacy in the romantic relationships of servicemembers with these disorders appear likely to interfere with their interactions with their children as well. Thus, the effect of post-combat mental disorders may extend beyond the life span of the afflicted servicemember, stretching across generations. It may take decades to count the costs of these afflictions, and decades more to heal from them.

## Summary and Recommendations

In general, the literature suggests that the three conditions we examined—PTSD, depression, and TBI—have wide-ranging and negative implications for those afflicted; moreover, the consequences of these conditions appear to have more notable similarities between conditions than differences. For example, the presence of any one of these conditions predicts a greater likelihood that an individual will experience other psychiatric diagnoses. All three conditions increase an individual's risk for attempting suicide. All three have been associated with higher rates of unhealthy behaviors (e.g., smoking, overeating, unsafe sex), higher rates of physical health problems, and higher rates of mortality.

In addition to the direct implications of these conditions for the afflicted individual, each of these conditions appears to affect the way that afflicted individuals interact with their social environments. Thus, individuals experiencing any one of these conditions, especially PTSD and depression, tend to miss more days of work, report being less productive while at work, and are more likely to be unemployed. Psychiatric illnesses appear to predict homelessness as well, although this literature suffers from serious methodological limitations. Finally, all three conditions have profound implications for interpersonal relationships—disrupting marriages, interfering with parenting, and ultimately giving rise to problems in children that extend the costs of combat experiences across generations.

The effects of a post-combat mental health conditions can be compared to ripples spreading outward on a pond. But whereas ripples diminish over time, the consequences of mental health and cognitive conditions may grow more severe, especially if left untreated.

The studies we summarized above offer consistent support for the integrative framework proposed here. That framework describes the consequences of mental health and cognitive conditions as a cascade of accumulating challenges and negative outcomes that, if allowed to continue, may expand to affect more and more domains in an individual's life. Prior research on military and civilian populations indicates that these cascades can and do occur. The direct results of a condition (i.e., impaired cognitive and emotional functioning) can have immediate consequences for the individual (e.g., additional psychiatric problems, poor health-maintenance behaviors), which themselves accumulate and contribute to additional problems (e.g., with physical health, work performance, and interpersonal relationships).

The model further suggests that the likelihood of experiencing a negative cascade is greater to the extent that (1) the initial symptoms of the condition are more severe and (2) the afflicted individual has other sources of vulnerability (e.g., unstable family relationships, low socioeconomic status, a prior history of psychopathology). Indeed, the research we reviewed consistently shows that individuals afflicted with one of these conditions experience worse consequences when they must simultaneously confront

other sources of stress, whereas other sources of strength (e.g., supportive family relationships, high socioeconomic status, high education) may serve as buffers, even for those whose symptoms are relatively severe.

Given the estimated prevalence of PTSD, depression, and TBI in servicemembers returning from Afghanistan and Iraq, the picture that emerges from this review may appear bleak, but the accumulated results should be kept in perspective. Each of the studies reviewed here indicates only that servicemembers who return from their deployments with one of these conditions are *at increased risk for these negative outcomes*. Virtually none of the studies we reviewed were controlled trials, and thus may not be able to detect causal relationships between these disorders and subsequent adverse consequences such as homelessness, substance abuse, or relationship problems. However, these studies are important for understanding the range of co-morbidities and behavioral outcomes likely to be associated with PTSD, depression, and TBI, as this information is relevant for determining the required resources for treating servicemembers and veterans with these conditions. Most servicemembers, however, are returning from combat free from any of these conditions. Moreover, even those afflicted with post-combat mental health and cognitive conditions may remit spontaneously and may, with adequate treatment and support, avoid negative outcomes altogether. Effective treatments for PTSD, depression, and TBI exist (see Chapter Seven for discussion of treatments) and can greatly improve functioning and outcomes. Even without treatment, however, some servicemembers and veterans with these conditions will recover. Therefore, although this research emphasizes probabilities, it should not be used to promote deterministic conclusions.

## Recommendations for Future Research

The literature we reviewed offers helpful information about the potential short and long-term consequences of PTSD, depression, and TBI; however, more research would improve our understanding of how these conditions will affect servicemembers and veterans. Below, we outline some issues that require further investigation and research.

**Address Causal Relationships.** The integrative framework we presented suggests that a post-combat mental health condition or cognitive condition causes negative outcomes that the servicemember would not have experienced in the absence of the condition. The research we reviewed is consistent with this position, but it cannot rule out alternative interpretations. Most of the research on servicemembers returning from Afghanistan and Iraq has yet to be conducted, and those studies that have addressed servicemembers have relied primarily on cross-sectional and retrospective designs—i.e., research participants have been contacted on a single occasion and asked to report on their experience of psychiatric symptoms and their functioning in other life domains.

Supporting causal statements about the effect of mental health conditions for servicemembers will require longitudinal research assessing members of this population on multiple occasions to determine the temporal ordering of symptoms and outcomes. Longitudinal research that successfully follows servicemembers from pre-deployment, through post-deployment, and into post-service would provide crucial insights into the etiology and consequences of combat-related mental health conditions. In the absence of such data, the existing research supports conclusions about how these conditions are associated with subsequent negative outcomes for servicemembers, but not about whether the conditions may be considered causes of those outcomes.

**Assessment and Diagnosis.** Although research on the prevalence of PTSD, depression, and TBI in servicemembers has relied on only a small number of assessment tools, research on the consequences of these conditions in the general population has used a vast array of instruments and strategies. Some research has examined associations between each condition and outcomes shortly after combat, whereas other research, especially research on veterans of Vietnam, has examined these associations years or even decades after the veterans had their combat experiences. Understanding how these conditions affect the lives of afflicted veterans and servicemembers will require greater attention to how and when these conditions are assessed.

**Generalizing Across Services and Components.** Research on the implications of mental health conditions in veterans of Vietnam rarely specifies the component of the military (i.e., Active or Reserve Component) or the Service within which the veteran served. Because different segments of the military are likely to have different experiences and have access to different sources of support, careful attention to service and component will be important in future research to understand the mental health implications of deployment to Afghanistan and Iraq. To inform the future allocation of resources between reservists and active duty servicemembers, research is needed that directly compares the prevalence and consequences of mental health and cognitive conditions across the Services and across the components.

**Gathering Population Data.** Virtually all of the data on the implications of post-combat mental health and cognitive conditions come from treatment, clinical, and help-seeking samples. Because those who seek treatment are likely to differ from those who do not, these samples are an inadequate basis from which to draw conclusions about the military as a whole. Systematic assessments of the entire military population will provide a more accurate sense of the distribution of post-combat mental health and cognitive conditions and their consequences, and thus a more accurate view of the true costs of the current conflicts.

## Conclusions

These three highly salient conditions in servicemembers returning from combat in Afghanistan and Iraq—PTSD, depression, and TBI—are not new. All three have been recognized for decades or more, and all three have been studied extensively for their associations with functioning in various domains of life. Although not without its limitations, this literature is nevertheless extensive and the results are consistent, providing a firm basis from which to project the likely consequences of these conditions for servicemembers returning from the current conflicts. In general, the review described here reveals those consequences to be severe, negative, and wide-ranging, affecting not only multiple domains of life for afflicted veterans and servicemembers, but their spouses, partners, and children as well. The predictions are not optimistic, but negative outcomes may be preventable with early and careful interventions. The research results assembled and summarized here may therefore serve as a call to action.

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